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Rise of the FPS

Gaming's greatest untold story exposed at last, in the words of the people that shaped it. p40

The legendary Captain Sulu

Interview with George Takei

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GeForce 6600 GT

Best bang for buck card ever made?

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How to: **Secure the Internet**

Safeguard your data with encryption

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Plus

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I wish

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I hadn't ordered my wife from bangkok-brides.com

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November 2004

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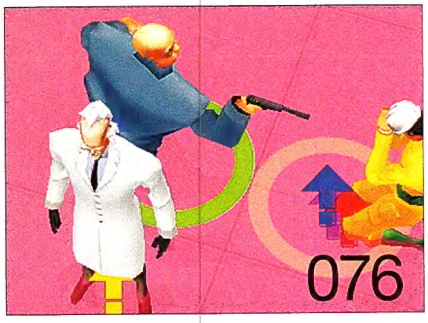
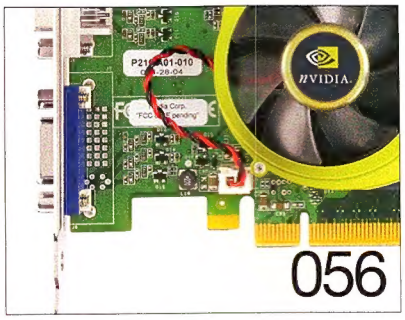
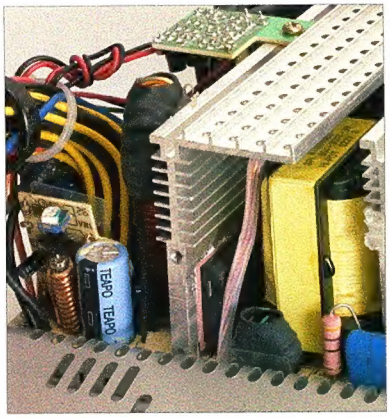
feature

Genesis of a Genre 040

The First Person Shooter genre was built on a lot more legacy than just that of id software. Logan Booker digs into the history of the FPS, and talks to developers great and small behind games like Ultima Underworld, Terminator: Future Shock, Duke Nukem 3D, Prey, System Shock, Terra Nova and other great moments in games history.

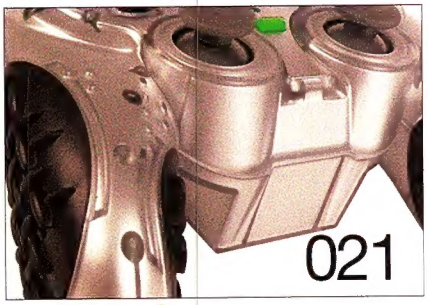


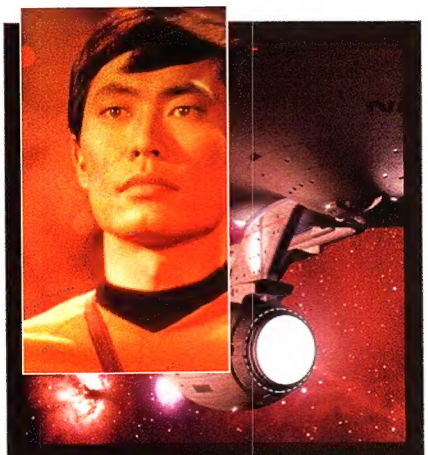




x-ray PSUs 030

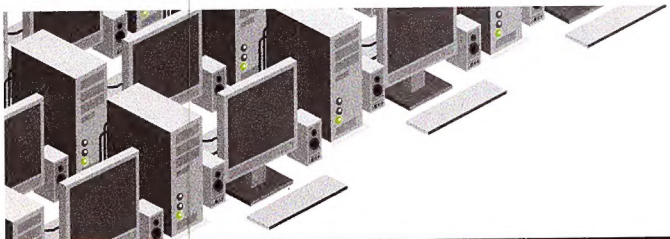
It is hard to get excited about a lifeless lump of componentry, no matter how many fans and other doohickeys are attached. It's the power supply that is charged with the task of turning this pile of uselessness into the high performance, lights a flashing beast that you want it to be. This month Dan Rutter looks at what makes a power supply tick, and which specifications you need to pay attention to when choosing the right dispenser of energy for your system.





Feature Sulu Speaks 036

Back before space was real, and the universe was made out of papier mache, old rags and a heck of a lot of cheap latex there was a television show. This show was called *Star Trek*, and apparently it was somewhat popular. And on this show was Hikaru Sulu, played by actor George Takai.
George swung by the *Atomic* offices and sat down with Logan Booker to chat about all things Sulu.



head to head IPv4 vs IPv6 033

In its very first incarnation the internet consisted of two cans connected by a bit of string which someone would use to shout 0 0 0 1 1 0 1 0. In those days there were only two IP addresses needed, 1 and 2. Since then things have changed and even the seemingly limitless IPv4 addressing convention is soon going to run out of free numbers. Ian Yates looks into IPv6, which pumps up the potential number of addresses, ensuring that our future will be filled with intelligent fridges, online doorbells and all sorts of goofy products.

edhead

Keys to success

It's common knowledge now that the gaming industry, valued at some US$20 billion a year, is bigger than the Hollywood box office. And it's not the least bit ironic that as gaming has become a big and burgeoning industry that the development of games has progressed along the same path as movies - bigger budgets, bigger roll calls, longer production timeframes, and worldwide exposure enough – compounding irony - to go as far as to produce movie licenses at times. We've yet to see a good one of course, but that's Hollywood.

In fact, gone is the age only a decade ago where a passionate few could band together with a modest budget and start writing their dream game. Now game developers belong to a studio, game publishers are multinational media moguls, and if you have anything less than a million in your pocket you might as well give up now.

It's damn impressive to consider just how fast the industry has accelerated, and just what it took to get there. Undeniably, at the heart of it all, lies the revolution that was the first person shooter – an immersive, accessible, and immediately gratifying game – a combination so successful that it was key to propelling the gaming industry to where it is today. That WASD is a hallmark recognised by gamers everywhere is a testament to the culture and environment that has made the FPS successful. This month we put Logan on the case to look into the glory days of gaming industry and who were the key players in making it happen. You can read it all starting on *page 40*.

We've also got an insightful interview with the legendary George Takei, a man *Star Trek* fans more commonly know as Sulu, about his time on *Star Trek* and a little on his experiences growing up in a World War II America, all starting on *page 36*.

Going hand in hand with this, and to help satiate that thirst for all things Trek, we're also giving away an authentic *Star Trek* communicator from the original series, so you can outclass your friends and their crappy miniature mobile phones with a truly revolutionary communication device. Better yet, there's also the chance to win the *entire* collection, all seven seasons and 48 DVDs, of *Star Trek: The Next Generation* if you subscribe to regular *Atomic* goodness. Yeah, crazy, I know. Half the team here are clamouring for the prize (the other half, *Babylon 5* fans, are snubbing it), but it's behind lock and key until one lucky winner can claim it. Be the first, see *page 94* for details.

Lastly, we've got the latest version of Knoppix on this months CD. We've run Knoppix before and it received tremendous feedback, but this time we've thrown in a tutorial to help you make the most of this superb bootable Linux distro. You can experience penguin power from *page 88*.

We've packed a lot into this issue and we hope you enjoy it. See you next month.

Ashton Mills
Editor

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Editorial
Editor: Ashton Mills amills@atomicmpc.com.au
Technical Editor: John Gillooly jgillooly@atomicmpc.com.au
Senior Writer: Logan Booker lbooker@atomicmpc.com.au
Staff Writer: Nathan Davis ndavis@atomicmpc.com.au
Senior Sub Editor: Melanie Farr mfarr@atomicmpc.com.au
Sub Editor: Sarah Cooper scooper@atomicmpc.com.au

Design
Head Designer: Tim McPherson tmcpherson@atomicmpc.com.au
Designers: Troy Coleman, Jason Cupitt
Product Photography: Chris Walsh

Contributors
Ben Mansill, Tim Dean, Simon Peppercorn, Daniel Rutter, Craig Simms, Virtuoso, James Wang, Peter Sbarski, Maurice 'moz' Ford, Charlotte Mather, Dan Chiappini, Luke Gould, Ian Yates, Anna Gillooly, Andy Jackson.

Production
Production Coordinator: Alison Maybury amaybury@atomicmpc.com.au
Traffic Coordinator: Jamie Dickson jdickson@atomicmpc.com.au

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Advertising + Marketing
t + 61 2 8399 3611 t + 61 2 8399 3622
Strategic Accounts Manager: Darren McNally dmcnally@atomicmpc.com.au
National Advertising Manager: Jon Westnedge jwestnedge@atomicmpc.com.au
Head of Marketing: Kate Imberti kimberti@atomicmpc.com.au
Retail Marketing Manager: Emma McRobert emcrobert@atomicmpc.com.au
Loyalty Marketing Manager: Lucia Cursio lcursio@atomicmpc.com.au

AJB Publishing
t + 61 2 8399 3611 f + 61 2 8399 3622
PO Box 2286 Strawberry Hills, NSW 2012 Australia
CEO: Adrian Jenkins ajenkins@atomicmpc.com.au
General Manager: Simon Corbett scorbett@atomicmpc.com.au
Head of Editorial: David Hutchins dhutchins@ajb.com.au

Subscription enquiries (including change of address)
Aust – t +61 2 9492 7399 f +61 2 9492 7310
e subscriptions@atomicmpc.com.au
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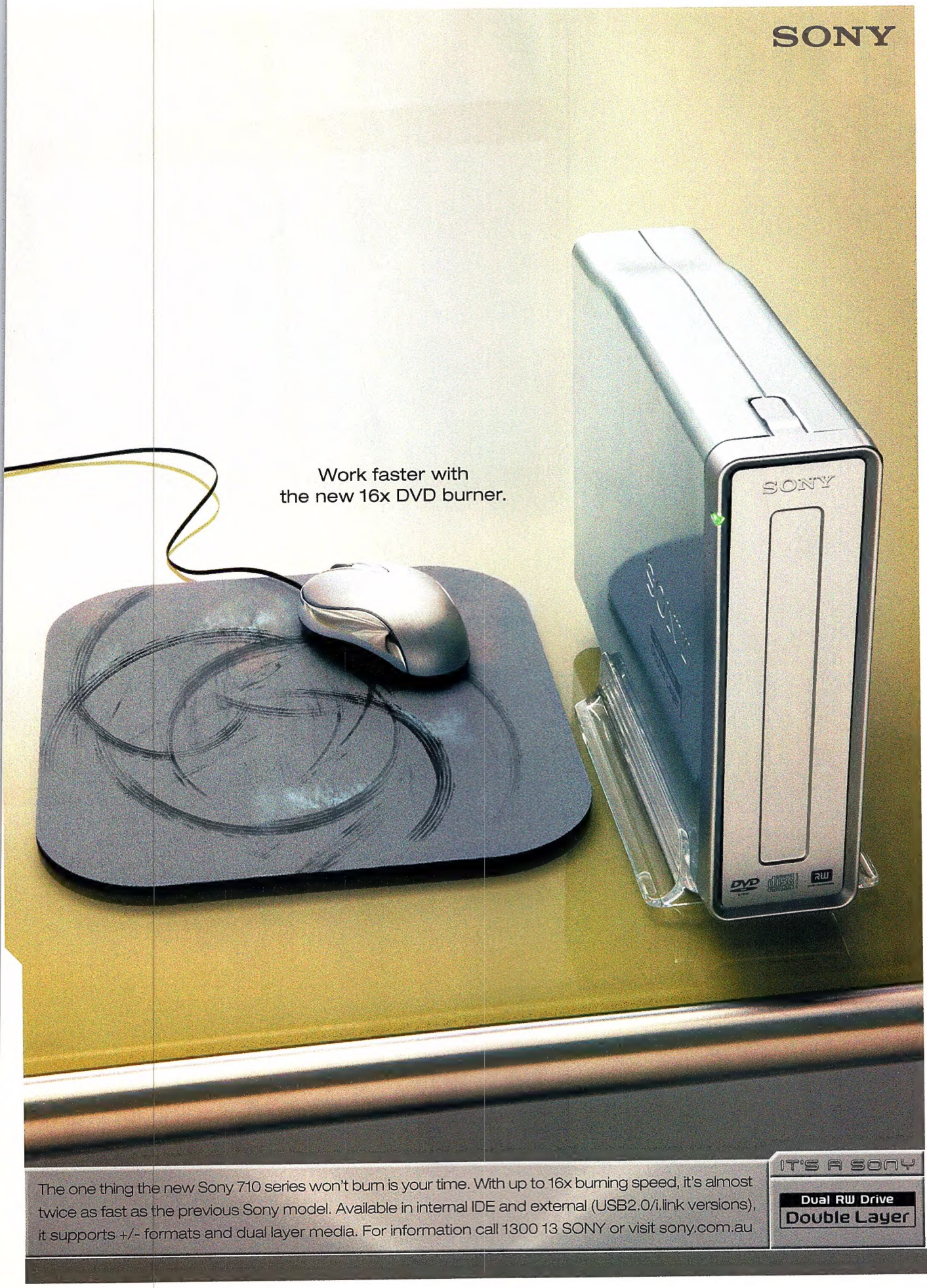
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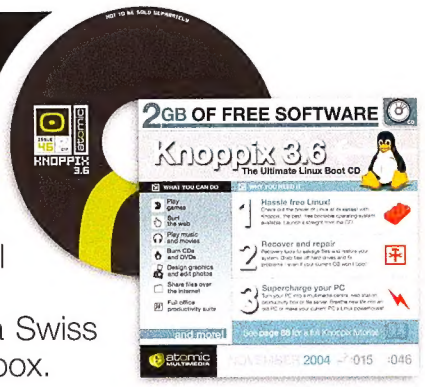
CDGuide

Penguin Power



Knoppix is the undisputed king of bootable Linux CDs, and this month you'll find the latest and greatest on the cover. It's a fantastic introduction to Linux, and a Swiss army knife of system utilities for your toolbox.

What is Knoppix?

Knoppix is a self contained open source bootable Linux operating system you can use to explore the power and functionality of Linux without ever touching the hard drives in your system – just boot it from the CD, and reboot when you're finished. Don't be fooled by the single-CD nature of Knoppix – through the magic sexiness of a *compressed loop* filesystem Knoppix comes with almost 2GB of software. This allows for a fully functional and easy to use Linux desktop packed with programs ranging from media playback and web tools through to office productivity and games, all contained on and bootable from a single CD. What will those open source boffins think of next?

If you so far haven't tried Linux before, Knoppix is an easy and hassle-free way to see what the fuss is all about. And because it's bootable and contains so much software, it also happens to be an excellent resource for system maintenance and recovery – if your Windows won't boot, Knoppix will and you can still access and recover your data.

While there are other self-contained bootable Linux distributions, Knoppix is still the best. Read this page first for a brief introduction in tailoring the boot options for Knoppix, and then see *page 88* for a full tutorial.

Booting Knoppix

Knoppix is a bootable CD, so all you need to do is ensure your BIOS is set to boot from CD-ROM. Knoppix does a pretty good job at detecting and configuring all your hardware, but it is configured by default to run on the widest range of systems. As a result it defaults to a low refresh rate, but thankfully you can specify options at boot time to tailor its operation. If you know, for example, that your monitor can happily handle a 1024 x 768 resolution and 85Hz refresh rate you can specify this when you boot Knoppix like so:

```
knoppix screen=1024x768 vsync=85
```

New Knoppix

A special addition to this latest version of Knoppix is the option of booting a 2.6 based kernel. Linux zealots will already be bouncing up and down with glee at what this represents, but for the rest of you the short summary would be this: the 2.6 kernel is the next-generation recently released core of Linux. It features substantial performance improvements, hardware support, and nifty features Bill would love to put into Windows but wouldn't want to be caught copying those open source freaks. So, in short, try it out. To boot Knoppix with the 2.6 kernel over the default 2.4 kernel, launch it like so:

```
knoppix26 screen=1024x768 vsync=85
```

There are quite a few other boot options you can specify as well. Press F2 and F3 to see the standard ones and, later, for a full list take a look at the file 'Knoppix-cheatcodes.txt' in the Knoppix directory on the CD.

Note: Knoppix loads everything from the CD, so launching programs and using the desktop will only be as fast as your CD drive. Don't expect it to be blazingly fast, however if you like Knoppix you can in fact install it to your hard drive using one of the built-in wizards. In the meantime if you have more than 512MB of RAM you can tell Knoppix to load the entire CD into memory, giving you a faster OS than either Windows or Linux from your hard drive.

To do so append the 'toram' option like so:

```
knoppix26 screen=1024x768 toram
```

Using Knoppix

Knoppix will try and grab an IP address for your network card via DHCP when it boots. If you use a static address, or DHCP didn't work at boot time, first click on the penguin in the 'start' bar (second from the left) and select to configure your network card. Configure your card as you would under Windows with DHCP or a static IP address (don't forget to write down your ISP's DNS servers before you leave Windows).

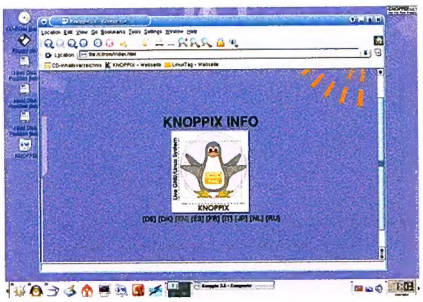
Once configured you should be able to access your network and the internet as per normal. Check by launching Mozilla and surfing to www.atomicmpc.com.au.

Knoppix uses the KDE (K Desktop Environment), one of many desktops available under Linux. It's very much like Windows but sports much more configurability. Application wise Knoppix includes programs such as The Gimp image manipulation program, K3B CD authoring, XChat IRC, desktop publishing with Scribe, XMMS for music (aka WinAMP for Linux), OpenOffice, and even some trendy time wasters like Frozen-Bubble.

Speaking of which, while Knoppix will run games it makes use of the XFree86 graphics drivers, which excel at 2D but lack proper 3D support. If you want to play 3D accelerated games you need to install accelerated drivers, just as with Windows. Bear in mind Knoppix is designed as a workstation distribution, so this can't be easily done on the read-only format of the Knoppix CD.

Lastly KDE isn't the only desktop system Knoppix comes with. Check out the aforementioned cheatkeys for a list of alternative desktops. For a sleek and minimalist approach try adding 'desktop=fluxbox' to the command line when you boot.

If you like what you find, you can also set up Knoppix to use a portion of your hard drive for storing user account details. Knoppix will automatically detect and allow you to access all FAT32, NTFS and Linux based partitions it finds, but keep in mind write support to NTFS volumes is disabled unless you use the Captive NTFS driver (see the tutorial on *page 88* for more info). Happy exploring!



News

ShortCircuits

According to a press release from BioWare, the company has licensed Epic's next-generation graphics engine, know as Unreal Engine 3, for use in an unnamed future project.

BioWare, responsible for such titles as Neverwinter Nights and Baldur's Gate, is not exactly known for its FPS titles – mainly because it has none. Apparently, BioWare already has a team 'hard at work' on the technology, which will be used for an entirely new game. Last month BioWare announced that Obsidian Entertainment, headed by Black Isle Studio veteran Fergus Urquhart, would be developing Neverwinter Nights 2.

It's official – the final release candidate for Half-Life 2 has left its berth at Valve Software and is with publisher Vivendi. This means that it won't be long before copies make their way to store shelves; Steam users will have their preloads unlocked and file-sharing networks globally will be clogged. The news was first declared by Gabe Newell himself over at the HL2 Fallout forums. After the shenanigans that transpired a few weeks ago involving a hacked Gabe Newell account and a similar announcement post, this victory message from Gabe was met with a certain amount of scepticism. According to sources however, it's genuine, and we hope to have a review ready to go for you next month. Unless of course the guy with the RC gets mugged on his way to the duplicators.

Remember Cell? Toshiba recently announced that work on the advanced processor is nearing completion – which means Sony can get to work finalising the PlayStation 3. Cell processors won't be pumped out until sometime next year, so don't expect the PS3 to be hitting your local KMart just yet.

Both Toshiba and Sony have plans to use the processor in a range of devices – set-top boxes, servers, nuclear missiles, etc. Cell's main selling point is its ability to work in parallel – according to sources, the PS3 could feature anywhere up to eight Cell chips.

Australian Game Developers Conference 2004

It's Australian and it involves games. And developers. So how could it be anything else but the Australian Game Developers Conference 2004?

Simply put, it couldn't.

Held in the warm grasp of slick and vivacious Melbourne, during the waking hours of 2 to 4 December, AGDC brings together both local and international developers, as well as hardware and software vendors, to discuss the state of the industry, show off upcoming titles, and to chew the fat about all things game-related. AGDC has been going strong since its first event back in 1999, and has grown in size year-on-year.

Along with an Aussie showing of companies such as Pandemic, the studio behind the recently released Full Spectrum Warrior and the fantastic looking Destroy All Humans!, NVIDIA, Sony and discreet will be there in force.

Keynote speakers include Naughty Dog's Jason Rubin (Crash Bandicoot) and Grant Collier of Infinity Ward (Call of Duty), as well as former Blizzard honcho Bill Roper, who, as we all know, is that crazy guy behind Warcraft, Starcraft and the incessant click-fest Diablo. Bill Roper now heads Flagship Studios after an impromptu departure from Blizzard.

AGDC isn't all about keynotes and presentations though – social events including Sony's PlayStation2 'Big Party' and Krome Studios 'Women in Games' party will be active centres of fun and talky-talky.

Of course, *Atomic* will bring you the details of Australia's premiere game developer event, right down to the pamphlets and podiums – because podiums can be exciting too.

Don't forget to check out www.agdc.com.au for more information.

A very Atomic wedding

More than just a mag – part 323. The *Atomic* universe extends well beyond these pages, as we're sure you are aware. For almost four years the beautiful melting pot that is the *Atomic* Community has fused together.

With the forums (www.atomicmpc.com.au/forums.asp) as home base, so many new friends have come together under the *Atomic* tree. We've had more than a few relationships blossom in that time too. Hundreds of *Atomic* events have helped bond us.

And now, we are blessed with our first *Atomic* wedding. Lord Dread and Fatal-Error tied the knot on Saturday, 11 September, after meeting through the *Atomic* forums. Naturally enough, nothing was done conventionally. The wedding took place at the annual Sydney Atomic Paintball day. Yep. Paintball. This was a first for Action Paintball (the venue) too, and they felt as special as anyone else who was there on the day.

Lord Dread and Fatal-Error looked gorgeous in their pressed camo gear. Fatal's camo veil was admired by all.

A simple and moving ceremony on a lovely sunny day was the perfect inspiration for everyone present to run around shooting each other all day long. The dozens of Atomicans present shared the happy couple's joy and we wish them a most wonderful life together.

So, hit the forums and find true love, Atomicans. Someone special is out there waiting just for you. Get jiggy, get hitched and get it going on! In just a few short years we could have millions of Atomican babies! Maybe billions!

News

Consensus IT Writers Awards 2004

Each year – as annual events are wont to do – Consensus (www.consensus.com.au) held its IT awards ceremony at Sheraton on the Park in Sydney.

Consensus has been running the IT Writers awards for almost a decade, recognising the best writers and journalists in the IT industry. This year, the awards were sponsored by Optima Technology Solutions.

It should come as no surprise then that AJB made a strong showing, with *Atomic*'s Ashton Mills, Ben Mansill, Tim Dean, John Gillooly and *PC Authority*'s Dan Chiappini all finalists in awards ranging from Best Technical and Most Controversial, all the way to Best Headline and Most Entertaining.

Ashton Mills took out both Best Technical and Most Controversial, with John Gillooly coming in as a finalist in Best Technical and Tim Dean as a finalist in Most Controversial. Dan Chiappini kicked butt with Best Headline and John was also a runner up in this category. Ben Mansill made it as a finalist in Best Editor. Go Ben!

ABOVE: *Atomic's* Ashton Mills and John Gillooly cleaned up the Best Technical category at this year's awards.

Including the Sun Microsystems IT Journo Awards held earlier this year, in which Ashton and John also won Best Technical and finalist Best Technical respectively, *Atomic* has cleaned up in all technical categories for awards in the industry – which is expected, considering how fantastically technical *Atomic* is. In fact, we're so technical, you'll need a screwdriver to read next issue!

We're kidding. Sort of.

ABOVE: Consensus award winners featuring Tim Dean, Vivienne Fisher, Ben Mansill, Ashton Mills, Dan Chiappini and Siobhan Chapman from AJB Publishing.

Microsoft and Mozilla secure shaky ships

Every month seems to be vulnerability month, and usually the star is Microsoft and Windows XP. This month Microsoft is not alone in battening the hatches of its products, with Mozilla's Firefox and Mozilla browsers requiring emergency repairs in light of some newfound security holes.

Just mere weeks after the release of Service Pack 2, two new breaches have been found in not only Windows XP, but also 2000 and Microsoft's Office suite of products. The first problem affects GDI+, or Graphics Device Interface that accompanies Windows XP and 2000, and is responsible for writing images and windows to the screen – an overflow in JPEG image-handling routines could potentially allow the execution of code.

Up next is a fault in the WordPerfect Converter found in Office. Regardless of the fact that no one uses WordPerfect anymore – apologies to those who still do and people stuck with Lotus or similar – the vulnerability, like the GDI+ hole, allows for remote execution of code.

On the open source front, a number of potential security flaws were recently patched as part of an update to Mozilla's Mozilla and Firefox browsers. The faults included: an integer overflow in the handling of bitmaps allowing code execution; a clipboard leak related to JavaScript; a heap overrun related to the 'send page' function; an issue that would result in confusion over privileges with scripts; and a heap overrun related to the processing of non-ASCII characters.

As of writing, updates were available for the aforementioned flaws.

News

WCG Australian finals

Before the global finals for the World Cyber Games, which were held from the 6-10 October in San Francisco, came Australia's finals. Held in Sydney at the Redfern Technology Park, the weekend highlighted the blood, sweat and tears that competitors were ready to shed for the chance of WCG glory.

The weekend wasn't just for the hyper competitive, SGL was there running a Bring Your Own Computer event in conjunction with WCG, which was full of people whose prime intent was to have fun. The WCG also featured a small product expo, showing off wares from sponsors Gigabyte, Samsung, AMD, Cooler Master, Twinmos, Western Digital and Pluscorp. Also present was THQ, who was giving gamers a sneak peak at the long awaited Warhammer 40K: Dawn of War game and Xbox, who had the Master Chief in attendance.

With the winners of five major categories being decided, there was constant competition as players rushed, camped, creeped, respawned and Zerged their way to victory. In the end there could only be one winner in each category, but the victories were all well deserved and the spirit of the event shone through.

Winners

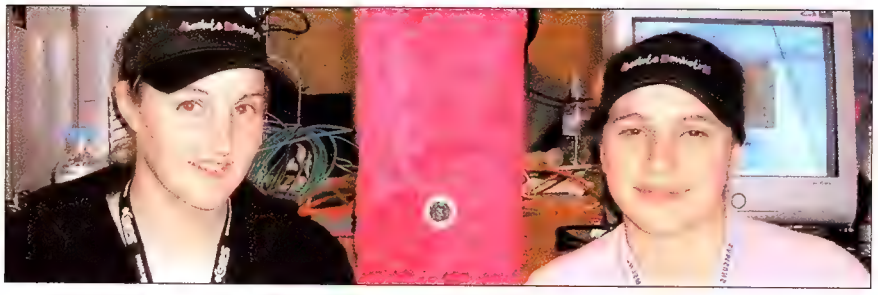
Counter Strike:Condition Zero
Winners - 23 | Runners up - Function Zer0

Unreal Tournament 2004
Winner - Kore | Runner up - Sickz

Warcraft III:Frozen Throne
Winner - mOOn-GLaDe | Runner up - BMi.PhilBoT

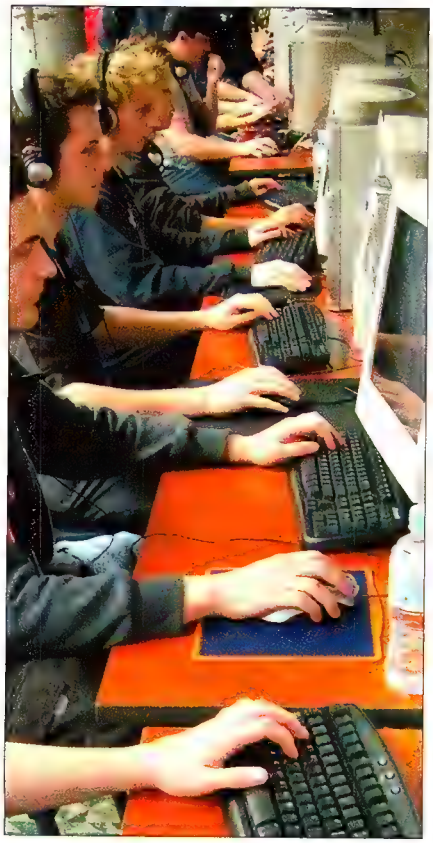
Starcraft: Brood War
Winner - Legionnaire | Runner up - Razor

Halo - Xbox
Winner - UTB_General | Runner up - Davman



LEFT: Case mod of the weekend goes to Cristina Faraone and Kim Dawson of clan Absolute Dominatrix.

BELOW: While official competition raged others took the more relaxed route of the BYOC area.



ABOVE: Finals were carried out in a separate area, using standardised PCs.

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Enjoyment Matters

Wanted: Cheap giant bit barrel

It's not the size, it's how you store it; so says Daniel Rutter as he gets organised.

Parkinson's Law of Data states that: 'Data expands to fill the space available for storage'. It was true in the days of 300 baud cassette storage, and it's still true in the days of 300GB hard drives. Amazingly enough, more and more people are finding themselves needing more storage than any one drive can give them.

The result is not usually pretty. A couple of 250Gb drives in your main PC, an old Socket 7 box in the corner with four questionably reliable 120s straining its dusty PSU, bare drives sitting loose on the bottom of cases that have run out of bays...

What we need is a handy-dandy network storage appliance into which you just plug drives, and which takes care of the details itself. Start out with a couple of drives, add more as you need them, and watch the Network Attached Storage (NAS) shared 'drive' on your LAN get bigger as a result. Integrated backup system essential, integrated data redundancy a big plus, reasonable ease of use and low purchase price essential.

Gadgets already exist that have everything but the last two features. Enterprise storage giant EMC's Clariion (from the people that brought you Siimon Reynolds...) AX100, for instance, will set you back a hefty US$5000 even when it's only got three miserable 160Gb SATA drives in it of its 12 maximum.

The AX100's got features that home and small office users don't need, though. Not just full Storage Area Network (SAN) operation as well as NAS, but a fibre channel interface and dual power supplies.

Use Ethernet for the external interface, settle for one non-redundant power supply, don't worry about SAN frills, and the hardware side can be an ordinary PC. Start with the four or six drives you can plug into most motherboards, and add on sub-$50 four-drive PCI ATA controller cards as necessary. With a reasonably beefy power supply, decent ventilation and enough 3.5-inch bays, it's no big deal to run more than 20 hard drives from an ordinary consumer motherboard.

Then, of course, you have to tie them together into one volume. The obvious way to do that is with RAID (Redundant Array of Independent, or Inexpensive, Disks) 5, which lets you make as many identical drives (or partitions) as you like, gives you the capacity of all but one of the component drives put together, and can survive the death of any one drive.

Lots of regular PC users have experimented with RAID, thanks to the proliferation of cheap ATA RAID controllers on motherboards. If you want RAID 5, though, then you either have to buy yourself a more expensive controller card (a 3ware Escalade, for instance; a lot of rappers seem to think those are cool), or go for software RAID.

> **What we need is a handy-dandy network storage appliance into which you just plug drives, and which takes care of the details itself.**

Some people do software RAID with one of the Server versions of Windows – non-Server versions can't do RAID 5. The enormous purchase price doesn't seem to be an obstacle, if the amount of mail I get from teenagers requesting help with Windows 2000 Datacenter Server is anything to go by.

One thing you can't do with Windows software RAID 5, though, is add to an array. You can't turn a three disk array into a four disk one without zapping the array and creating a whole new one.

Linux's software RAID can, at least in theory, handle array expansion, and it's not terribly difficult to set up. But strong men have wept over what you have to do if a drive fails. And you should take careful note of the 'at least in theory' part.

You can try to minimise the chance of a screw up by using a hardware RAID controller card that supports array expansion, like Broadcom's under-US$500 eight channel SATA BC4852. But even when it works, array expansion can take a *long* time. If it fails – which it may well do if you're asking consumer hardware to flog six drives hard for eight straight hours – then the whole array's contents will very probably be toast.

Accordingly, I reckon we may have to forego RAID 5 for a more cheap 'n' cheerful expandable storage system and instead head for concatenation. Or in other words – JBOD.

JBOD stands for 'Just a Bunch Of Disks'. It stacks disks of all shapes and sizes one after the other, making them all look like one volume. JBOD makes array expansion fast and easy, lets you chain drives of any capacity, but it's unreliable. If one disk fails, the whole JBOD volume becomes invalid.

So what we need is a JBOD system with automatic backup, to tape if you've got it but probably to DVD-R. That may require a bunch of DVDs for the first backup, of course, but incremental backups from then on will ease the pain, and the result will be a resilient storage silo. If and when a drive dies, you can just swap in a fresh one, and the software will tell you which backup disks it needs to recover the lost data. The software can also direct you to the failed physical disk, as long as you wrote the appropriate letter on the back of the drive when you installed it.

Mix ingredients into a nice compact custom Linux distro or large cumbersome Windows app, ice with big-happy-buttons GUI interface (with HTTP option, please!), bake for 50 minutes at 180 degrees.

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Computer people

Fear not the brave new world, for it is of our own making. Ben Mansill thinks the future computer is already here, at the movies.

'Open the pod bay door HAL.'

'I'm sorry Dave, I can't do that.'
'Come on HAL, don't be a dick. Open the bloody door.'

'Shields critical! Data! Take us out of here now! Warp 8!'
'Captain, I believe I am experiencing the emotion you often refer to as "panic". It is most fascinating.'
'Worf! Throw Data in the airlock and blow the hatch. La Forge, Warp 8, if that's not too much trouble.'

'Artoo! Try and increase the power!'
'bleep blonk blerk' (censored profanities)
'This is about 3PO, isn't it?'

The 25th century equivalent of a BSOD may well leave the user emotionally wounded, or worse, but if science fiction's prophesies eventuate, we only have ourselves in the *now* to blame. It's all Alan Turing's fault, of course. We are all grateful for his work on early computer development, and for making WWII a little easier to win, but it was his famous 'Turing Test' which started all this. His open challenge was for the creation of a program able to engage a human in typed conversation, so convincingly, that it would be assumed to actually *be* human. Anyone who can remember the Dr Sbaitso program which shipped with the original Sound Blaster can verify that it is indeed possible to emulate intelligence – if only the intelligence of a retarded parrot.

While Moore and his Law assure a steady plod along the path of increasing processing power, our quest to imbue our machines with a personality is equally relentless. Making computers 'people-like' is a holy grail being pursued with exponentially increasing vigour. But why?

It does seem ever so logical a pursuit, though. Issuing verbal commands to a machine makes computing so natural it's almost lazy. Speech interfaces have long been available. Issuing the command 'Computer! Print document!' may impress Steve Leibman, but I'd feel like a grade-A tool saying it out loud in the office.

No, convenience is not why we want to pursue this. We want a machine we can *relate* to. We want computers to seem human so we can tackle them on equal footing. To outsmart them on our own terms and claw back any diminished sense of intellectual capability. Forever we've been told that the human brain is more sophisticated than any computer. Well yes, but I'd need an hourglass to time calculating pi to a handful of decimal points, and I'm not even remotely inclined to do so in the first place. Tasks like that are why we invented computers. They're our number slaves. Blessed things.

We want computers to seem human so we can tackle them on equal footing. To outsmart them and claw back any diminished sense of intellect.

We will always need passive, silent and subordinate computers. Even in the distant future. Perhaps, especially then. Likewise, we will also have machines which pass as sentient. Whether they truly are self-aware is probably a moot point. They will seem individual and aware, just as, perhaps we do sometimes... But will they have true 'personality' – and will it clash with ours?

Science fiction showcased this relationship perfectly in the wonderful and hopefully prophetic *Blake's 7*. Two computers were the stars of that show – Zen, the obsequious, subservient ship computer, and Orac – a petulant brat of a machine. Zen was mellow-voiced and unquestioningly obedient. One almost feared its feelings would be hurt from being treated as a mere functionary, but it never faltered – until its destruction, when it poignantly referred to itself in the first person as it 'died'. Orac (which was also the first all-Perspex computer!) was touted as the smartest computer ever built (note the characterisation 'smartest', not 'most powerful'). A right prick of a thing, it would simply refuse to do anything it didn't feel like, despite grave emergencies. Each *Blake's 7* computer represented opposite extremes of human nature. Neither was ever acknowledged as being anything more than a machine by ship's crew, but each behaved in a manner befitting their station. Zen, who had all the menial tasks, acted like a depressed accountant who had long ago given up the fight, while Orac *knew* it was the smartest computer ever built, had no responsibilities, being just along for the ride for most of the show – and acted it every bit of the way.

The self-aware computer was characterised beautifully in John Carpenter's *Dark Star*. 'Bomb #20', a thermonuclear weapon designed to destroy entire planets, suffered a short circuit causing it to receive a false order to arm itself and begin the countdown to detonation. Unable to simply disarm the damaged device hanging beneath their ship, the desperate crew resorts to *talking* with the bomb's onboard computer, teaching it Phenomenology – being a philosophical doctrine in which considerations of objective reality are ignored. The crew was able to convince the computer that the order to drop may not actually have happened, as nothing other than the individual consciousness can be relied upon to be real. Pondering this for some time, Bomb #20 concluded that *all* data it was receiving via its sensors must therefore be false – including the existence of the ship, its crew and the universe itself. Bomb #20 then announced that, seeing as it was the only thing which truly existed, and its purpose was to explode, that it must fulfil the will of God – being itself, so it blew up killing everyone aboard. Descartes would have loved Bomb #20.

Science fiction has a solid history of showing us the shape of things to come. If computers are to be free willed, it is an evolution just beginning, and of our own making. Think about that next time you're mean to the Windows Paperclip helper.

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One point of view

Tim Dean puts it all in perspective, and makes a point about his favourite letter – the letter Z.

For this column, I thought I'd get right back to basics. Back to the roots of what this column is all about. To shed some perspective on things, and to get ourselves re-acquainted with the 'Z' in *Z-Access*.

It's no accident it's a Z, and not an X or a Y. That's because this column is all about depth. Z is the glorious dimension on a Cartesian plane that gives us that depth. Without that Z, we'd have no perspective, no 3D and no GeForces and RADEONs – and probably a whole lot less to write about in *Atomic* in general. So, let's take a moment and tip our hats in honour of that profound letter Z.

So, why is that Z so important? Well that's an interesting story. It's fascinating to note that the human brain has not changed significantly in the last 60,000 years or so, and yet so much has changed in the human mind in that time. One of these new features of the mind we take for granted today is our instant recognition of a 'representation' of something in the world, such as a painting of a bowl of fruit, a sculpture of an old dude's head, a photo of a friend, or a terrorist duck-jumping on a computer screen. Or something like Magritte's *Ceci n'est pas une pipe*.

It's a matter of conjecture whether prehistoric humans first delved into 3D art (sculpture) or 2D art (paintings), although I would not be surprised if it was sculpture that came first. This is because it's a far greater leap to go from looking at a series of lines on a cave wall and 'seeing' a bison than it is to look at a solid shape and comprehending what it represents.

We do know some interesting facts about the brain when it comes to our comprehension of representations. There are documented cases of people who have been blind all their lives and have had their sight restored when adults. These people can't even recognise themselves in photos – they have to learn this afresh. There are also cases of people with brain damage who lose the capacity to comprehend 2D pictures all together.

This means it's hard to know whether 2D visual representation is hard wired into our brains in any significant capacity, but we do know it's a very recent phenomenon. This is highlighted by the astounding fact it wasn't until the 15th century that artists nailed the concept of linear perspective. Before the 1400s, most art was either a-perspective, such as Greek frescoes, where each object has its own rough point of perspective, or they were just dreadfully unrealistic in their rendering of perspective, as in much medieval art.

Interestingly, there was a point of transition, where art moved from having no perspective to having 'empirical' perspective. This transition occurred somewhere after the move from frescoes to pictures (or as I see it, the artistic world's equivalent of moving from platform shooters to 3D FPSs). This is where the artist noticed there was something going on, and in an attempt to replicate what they saw in the world, they fudged their way into creating the illusion of perspective. There are some interesting cases where the artist even placed sizable objects, such as pillars, over the vanishing point rather than try and depict that point realistically.

Then came Brunelleschi, the Italian architect, who actually formulated a mathematical method of accurately representing perspective in 1413. He's now credited as being the first person to use linear perspective where there's one vanishing point.

The concept was quickly adopted by many other artists, who put it to immediate use as an artistic device. Not only were they now able to accurately represent a 3D scene on a 2D canvas, but they skilfully put the vanishing point to use to highlight specific aspects of their scene.

As the eye is naturally drawn towards the vanishing point in a picture, even when the vanishing point is off centre, it was usually where you'd find an important feature, such as the primary subject's face or eye. Even more cunning is where the vanishing point subtly (so subtly in fact that you're unaware of it happening) draws attention away from the primary subject to place emphasis on another feature, such as placing the vanishing point at Mary's womb in a religious painting.

> I like to imagine there is a little Z at every vanishing point, much like the pot of gold that sits at the end of every rainbow.

Furthermore, once the rule had been learned, it could be broken to specific effect. For example, the perspective could be deliberately altered in certain areas to create emphasis, or give the viewer the impression the image was radiating from a particular point or subject.

Then came the 19th and 20th centuries, where literal representation of a scene took a back seat to other perspectives, such as a conceptual or emotional representation. Or even the idea of having no representation.

Still, having existed for centuries, perspective is here to stay. It's thanks to Brunelleschi's principles that we have 3D games at all today. And it's for that reason I would like to raise my glass to him, and to the concept of perspective in general.

I like to think there's a little Z at every vanishing point, much like the pot of gold that sits at the end of every rainbow. So next time you see a vanishing point, follow it, see if you can reach it, and maybe you'll find the Z too. Or at the very least a leprechaun or some such thing.

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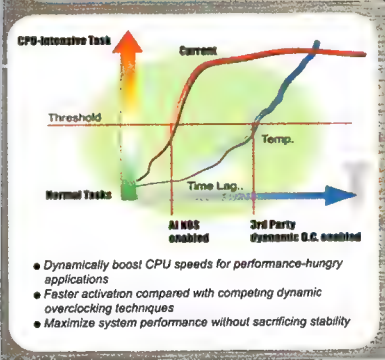

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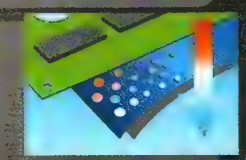

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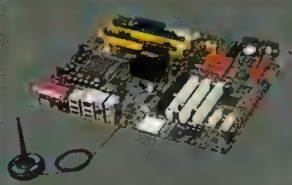

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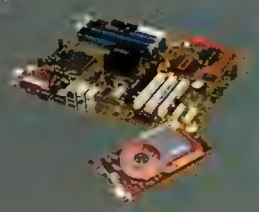

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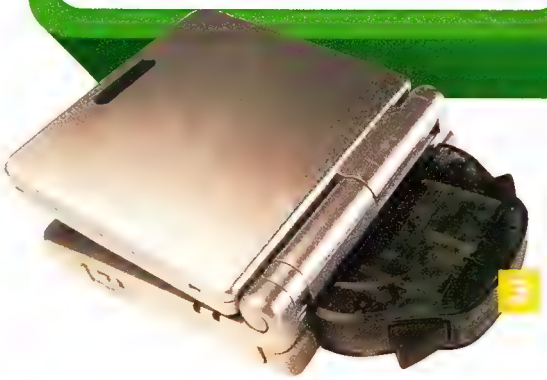
3 Nintendo GBA Wireless Adaptor

Supplier: Nintendo Australia
Website: www.nintendo.com.au
Phone: (03) 9730 9900 **Price:** $29.95

The GBA's Link Cable just doesn't cut the cool, but the new Wireless Adaptor is exactly how classroom gaming ought to be. Stealthy. Bundled initially with Pokemon FireRed and LeafGreen ($69.95 each) and compatible with Mario Golf, it will also be sold separately for $29.95. The tidy little unit snaps onto the rear of your GBA, and has a claimed 10 meter range, using 2.4GHz wireless. We found performance a little stuttery, but for Pokebattles that was acceptable. What took them so long to release this?



4 Leadtek DigiBank 1.5GB

Supplier: Rectron
Website: www.rectron.com.au
Phone: (03) 9561 6166 **Price:** $218

As if a blast from the past, data 'SneakerNet' portability is paramount and the larger the capacity, the better – as long as it's in a small package. With flash memory prices still through the roof, micro HDDs are the cheaper alternative for non-volatile memory. This baby is larger than a typical flash drive, but quite pocket-able and even comes with its own pouch. With speed enough to easily stream very high quality encoded video – with a transfer rate of 5.5MB/s – good riddance to the CD-RW.

5 Powerful AV Sender

Supplier: Altronics
Website: www.altronics.com.au
Phone: 1300 797 007 **Price:** $139

Using the 2.4GHz band, this kit of transmitter and receiver allows great transmission of RCA AV signals when a cable just doesn't cut it – through multiple walls. If lag is your concern, we played our consoles with no evident performance drop. To expand its options, an infra-red repeater has even been added, but it would have been great to see the inclusion of a 3.5mm audio jack or an adaptor. If your current telly isn't worth the expense, this is the ultimate, inexpensive Home Theatre PC alternative.

6 Anydrive Mini USB

Supplier: Anyware
Website: www.anyware.com.au
Phone: (07) 3856 3999 **Price:** $70

The tiny yet affordable Anydrive Mini fits the bill of 'big bits, small package'. Amazingly, this isn't the smallest flash drive available, but packing 128MB it's close, measuring merely 4mm thick and 4.1cm x 2cm. The plastic unit itself plugs directly into the USB port, bypassing the bulky protective sheath. The unit increases to a high temperature in use, but this didn't appear to affect the performance. Alongside a necklace, it's ingeniously boxed with a security program.

7 NYKO Air Flo Wireless PS2

Supplier: Conexus
Website: www.conexus.com.au
Phone: (02) 9975 2799 **Price:** $79.95

This PS2 controller is based around the same design as the nifty Air Flo mouse (reviewed *Atomic 44*), but it's wireless. Exceptionally designed with a great hug to your hand, the only fundamental flaw we could pick out was the return to the 'omnidirectional' D-pad – press down and you may score an additional direction. An included 'joystick' can be screwed in the centre of the D-pad for a truly bizarre experience. Nonetheless, with no lag, a great design and cooled hands, the consensus is 'this seriously owns'.

8 Blue Storm 400W

Supplier: Anyware
Website: www.anyware.com.au
Phone: (07) 3856 3999 **Price:** $109

Snubbing the typical riffraff often seen in PSUs today, the Blue Storm is equipped with an ingenious new 'Molex' plug design. This has grips on both sides to allow for a lesser degree of finger torture involved in the release of certain stubborn devices. It's definitely a silent PSU, unless the hairs in your ears are brushing against the 120mm fan. With a hard-wired 24-pin ATX connector and supplied 20-pin adaptor, and equipped with two SATA, six Molex and two floppy connectors it's an impressive offer.

9 Thermo Electric Cooler and Warmer

Supplier: PC Case Gear
Website: www.pccasegear.com.au
Phone: (03) 9584 7266 **Price:** $45

Seldom does one use all the juice in a system's PSU. Originally made for vehicular use, if you grab a 12v PC cigarette lighter kit this four litre cooling/heating unit will alleviate your desire to suck an additional 72W down the pipe. Cooling 20°C below ambient and heating up to 60°C, it's best if the item is already at the desired temperature, though it had no problem chilling lukewarm drinks. Short of grinding coffee between HDDs, it ensures you're ready for the cuisine inspired craze in computer enhancement.

10 Joytech PS2 to USB controller converter

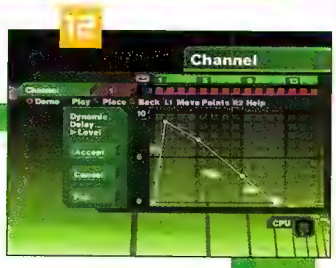
Supplier: Take2 Interactive
Website: www.take2games.com.au
Phone: (02) 9482 3455 **Price:** $TBA

Do you regularly fantasise about the day when you can become one with your favourite PS2 controller? Well, this doodad can push you closer to your odd convergence goal by providing a USB hub with two connection ports. This little feature allows the use of two PS2 controllers on your PC. In all its simplicity, it's a great idea as it enables you to jack in a controller to the PC without having to fork out for another entire controller – which you may or may not even like. Splendid.

11 RF Thermo Clock

Supplier: Altronics
Website: www.altronics.com.au
Phone: 1300 797 007 **Price:** $45

The transmitter of this wireless ambient temperature device can be located about 30 metres away – it monitors the temperature and humidity of its vicinity and sends this back to the receiver via 433MHz RF. One annoying attribute is the ear-splitting 'bleep' every time a button is pressed. Including an alarm clock, it has the time and both ambient temperatures displayed so you can see what's happening without having to jig an inch. You could use it as a case monitor for those essential lavatory breaks.

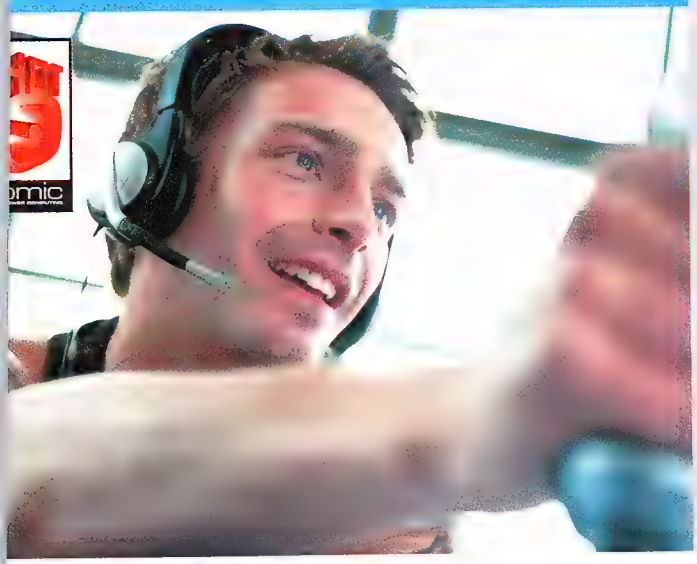


12 MTV Music Generator 3

Supplier: Atari
Website: www.atari.com.au
Phone: (02) 8303 6800 **Price:** $79.95

Ever heard the latest lame dance music by numbers hit on Nova and thought you could do better? Well now you can with this music studio for your own living room and Xbox. Remix allows you to make minor or major tweaks to pre-loaded songs from the likes of Outkast, Carl Cox and Snoop Dogg or rip samples of your own if you get bored of the standard options. Including a huge base of samples across the full spectrum of dance music genres you can piece together your next dancefloor smash.

If you're serious about gaming you should be wearing one of these!



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Hotbox

Brenton's Bar Fridge

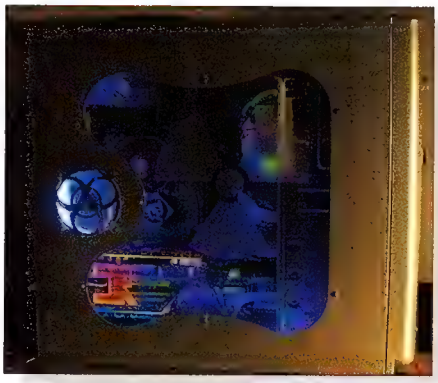
Technical details

- Pentium 4 3GHz
- 512MB RAM
- Maxtor 80GB 7200RPM
- Gigabyte Micro ATX 8S661FXM-RZ (everything onboard)
- 8X Sony DVD burner
- Cool Drive 4 Hard Drive cooler/ temperature sensor
- Custom made 480W ATX power supply
- Silent Steam water cooling kit
- LG bar fridge

This was my Year 12 HSC Design and Technology Project. I designed a unique case different in shape and colour with sound sensitive neon lights and water cooling.

I made the case in the shape of an iceberg out of fibreglass then modified a standard bar fridge to connect to a Silent Stream water cooling kit. I arranged for both the computercase and bar fridge to be professionally air brushed by MFX Grafx. On the front of the fridge door is a temperature sensor that monitors the water temperature inside. The radiator coolant solution, with anti-freeze of -40°C, was mixed with the water circulating through the bar fridge and computer case to prevent the water freezing. Blue sound sensitive neon lights were mounted in the computer case with a blue neon rod mounted under the bar fridge and a blue led light mounted inside. The total effect is awesome at night with the beat of music.

Jaxor's Radioactive Rig



Technical details

- Athlon 2800xp + TT volcano 12
- 512ddr pc2700
- Soltek sl-75mrn-l mobo
- GeXcube 9800pro Extreme (420/730)
- Seagate 40GB
- Seagate 80GB
- UV cathodes with custom switches
- Orange perspex symbol
- Cards painted with UV paint
- UV sleeving and cables
- Radioactive applique
- Painted CD drive covers

With this case, I aimed to have a moderately good looking case with relative ease – just so I could maybe get a few head turns at LANS.

I originally had a green cathode. However, this gave up and conked out after a while so then I decided to go for UV look.

I went on to experiment with highlighters inside and to be honest they worked fairly well. The next thing to do was find myself an adequate case.

When I first got the case, it was poorly ventilated. In addition, the temperature of the case was around 35-40°C, which was causing my CPU to completely shut down with its 'anti-burn feature'.

So, I decided to take to it with my jigsaw, and ended up with much lower temperatures (25-30°C). The bottom of the case was fairly bare, so I found some chequer plating, cut it to size and stuck it in. Easy!

HOT BOX David's (Wrath of) Khan

Technical details

- Pentium 4 2.8C @ 3.3GHz
- 512MB Kingmax PC3200 (dual channel)
- NVIDIA GeForceFX 5600XT 256MB
- Creative SoundBlaster Live! 5.1
- Broken floppy drive (just to fill in the gap)
- Single red cold cathode tube
- 2 Panaflo Brushless case fans
- Zalman Aluminium/Copper CPU HSF
- LIS LCD panel
- Hinged side panels

I wanted to make something that was a little bit different. To me, the best thing about this case is that it's completely built out of wood. Wooden computers are all about style and attract attention.

I started with a damaged in transport midi-tower, and after removing all the bent panels, I set about cutting and gluing and screwing until I ended up with a LAN-worthy case.

The only reason for the red theme is the colour of the cold cathode tube, which was a completely random spur purchase. However, I think the two go well together and the red really catches the eye.

The LCD is a VL Systems LIS Panel, and the CPU is kept cold with a Zalman AlCu Copper/Aluminium Heatsink. At one stage I had a vision of tidying all the cables inside, but it turned out this was too hard for a computer that spends as much time in pieces as together.

HOT BOX RabidFrog's Jerry Can

Technical details

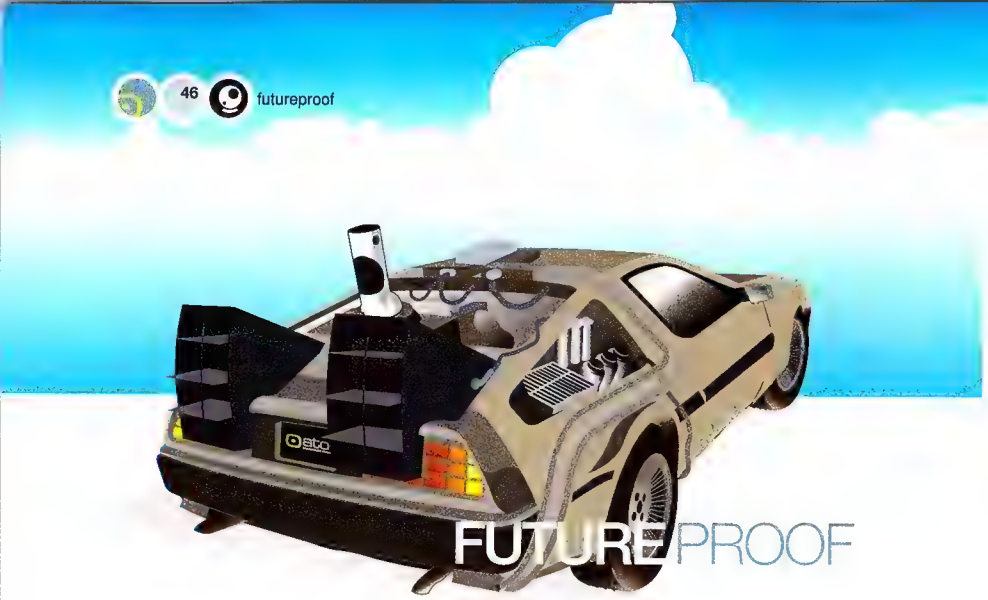
- Amd XP2600+ CPU
- Gigabyte GA-7N400-L motherboard
- 512MB PC3200 RAM
- On board audio
- On board LAN
- G-cube 9600XT Extreme
- 80GB Western Digital HDD
- One red jerry can!

The idea for this case came about on my holidays when I was working on my car in the shed and walked past an old jerry can. I wondered: would a PC fit in that?

I went and bought a new jerry can and started hacking. It was a little tight to fit most internal items, so the old floppy drive and CD-ROM had to be ditched. The motherboard tray and power supply came from an old case and were reworked to fit, the on and reset switch were put in the lid and a couple of lead's up the top for power and HDD activity.

There are two 80mm fans, one up the top and one in the front and air is drawn in the top and out the bottom. This works pretty efficiently.

Over all it took about six to eight months working on and off to complete and is now solely used as my gaming rig.



Digital 'Home Sweet Home'

Dan Chiappini takes a look under the hood at Intel's move to 65 nanometer chip development and the state of play for the digital home.

In an age where we're confronted on a regular basis by the spiraling size increases of CPU clockspeeds, GPU performance and beer excise, it's nice to see someone is working on making things smaller. Intel has been waving the shrinking development flag with its recent announcement of creating working 65nm (a nanometer measures just one billionth of a meter) 70MB Static Random Access Memory (SRAM) chips packing over 500 million transistors. This serves as a technology 'proof of concept' for Intel's progression to 65nm products once 90nm silicon has run its course.

We're not expecting to see chips on the shelf for a while yet, as Intel suggest it will be the second half of 2005 before 90nm shipments overshadow currently circulating 130nm Northwood CPUs, although they do believe they're on track to begin the first 65nm production run some time next year.

Of course a move like this to new scaling dimensions has some rather daunting challenges ahead for Intel's engineers to solve before there's any silicon to play with. Namely, limitations of current lithography techniques, dimension control, mask making. In addition, engineers need to ensure the chips still offer increases in performance, and resolve issues such as leakage power, active power and one of the biggest trials – cost. Cost is one of the largest determining factors for Intel remaining with the 300mm wafers used for semiconductors coming out of their D1D fab in Hillsboro, Oregon. The other factor is the higher die yield compared to 200mm wafer fabrication.

Transistors produced using the 65nm technology have switchable (on and off) gates which measure just 35nm, which are roughly 30 percent smaller than current gate lengths in 90nm Prescotts. The new 65nm transistors offer a range of new features designed to conserve power and improve performance.

Intel's first generation Prescott CPUs left a lot to be desired when it came to heat output and power consumption, clocking in anywhere up to a scorching 103W and, depending on who you listen to, needing up to 12 400W power supplies to run the thing. Some of the power saving tricks on the cards include laying a uniform 1.2nm thickness of gate oxide and choosing a 35nm gate length which allows for a 20 percent capacitance reduction. When combined with active power improvements this helps to avoid increased gate leakage by lowering the levels of gate capacitance. The final piece of the puzzle is Nickel Silicide to lower resistance in source drains. Current 65nm development reduces transistor leakage by up to four times, hopefully offering better than Prescott performance with Northwood operating temperatures and power usage. Intel are continuing with the same strained silicon production methods currently in use with 90nm production on 65nm but are enhancing the straining process to improve performance. These improvements are said to offer gains of up to 30 percent over non strained silicon.

While the oft quoted Moore's Law dictates that the number of transistors doubles roughly every two years, for too long the CPU industry has been chasing the curve to keep up, never really making any headway on leading the law. Intel believes it is on the cusp, yes we said it, cusp of putting the boot into Moore's foresight by unleashing a 1.72 billion transistor CPU fairly shortly – not for the desktop, but in the form of Montecito, successor to the Madison 130nm process Itanium2 processor. Interestingly enough the bulk of Montecito's huge number of trannies are going to be in the form of cache, with this badboy packing 24MB of integrated L3 across two cores on 90nm process.

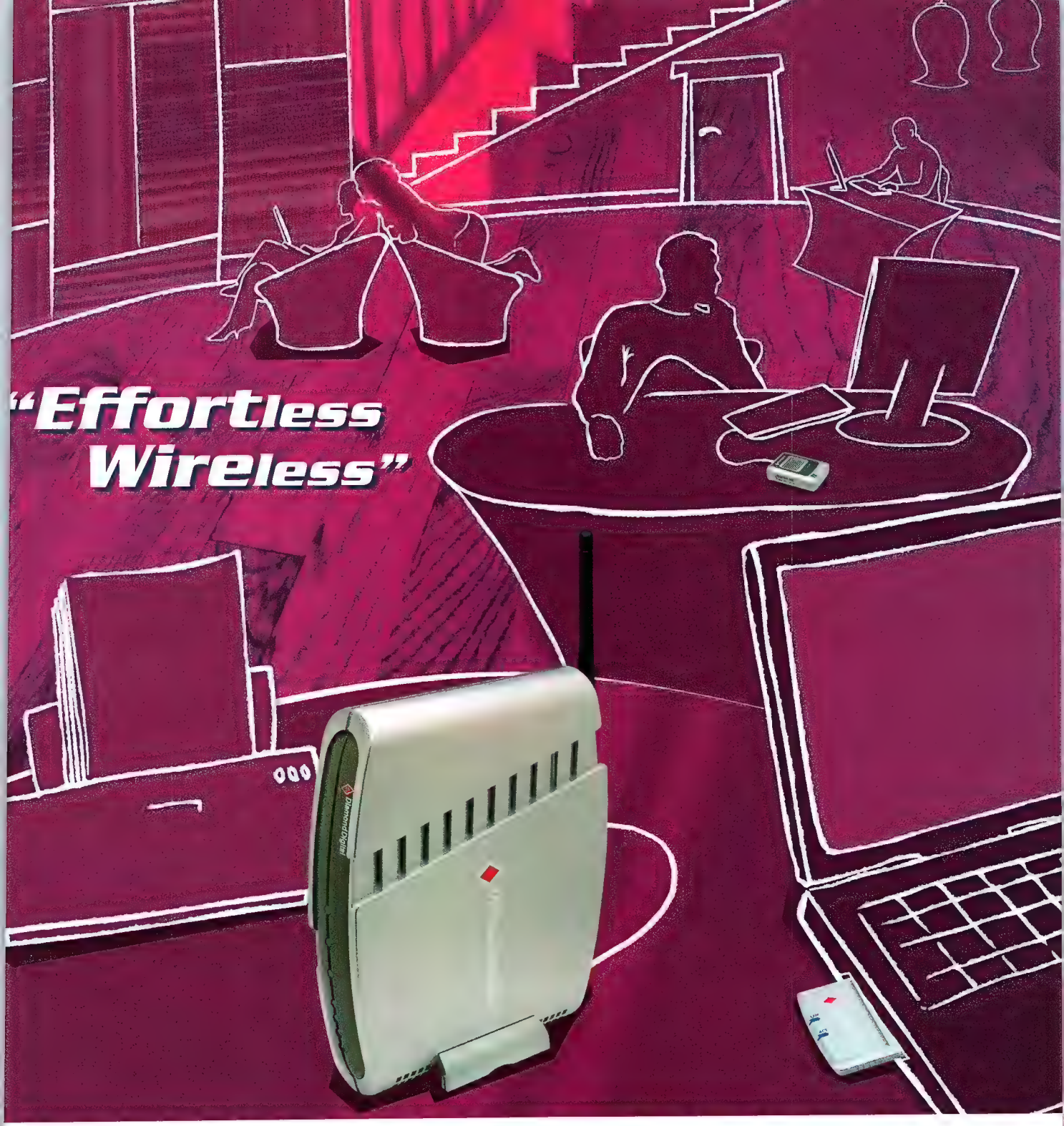
While 90nm signaled the move away from the copper interconnects found in 0.13 micron production to ones based around a seven layer, strained silicon,

ABOVE: Intel believes it is on the cusp of putting the boot into Moore's foresight

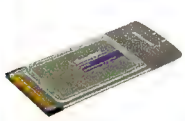
low-k material, 65nm looks to be a more advanced 90nm process. Rather than adopting the swathe of new technology like Intel did with 90nm, it has focused upon further improving strained silicon switching, continuing to use a low-k carbon doped oxide (CDO) dielectric and adding an eighth metal layer for improved density, performance and power saving.

Another power saving feature of Intel's 65nm 70MB SRAM chips is the addition of an NMOS sleep transistor to help sleep transistors shut off inactive parts of the SRAM cache sub-blocks, the end result being lower power leakage and better power consumption. This effectively translates to a real advantage for mobility uses such as laptops and tablet PCs.

65nm as a concept ties in very heavily with this year's general IDF



Diamond Digital



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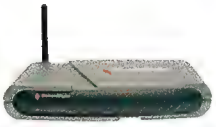

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The digital age is well and truly on the way – and although it may not get here this year, it is looking like everyone is investing a sizeable fistful of cash to get it off the ground.

theme of the digital future. While there's been a push from hardware vendors and plenty of talk everywhere else, digital convergence as a way of life still hasn't happened. We still had to type this out on a PC rather than talk into a toaster for transcription services (probably for the best anyway, or we might burn ourselves on the heated elements inside).

Almost every announcement and tech briefing had a connection to the digital home. WiMAX (IEEE 802.16-2004) is a brilliant piece of tech which works in conjunction with Wi-Fi and could bring broadband internet access to even the most difficult of rural and poorly cabled urban areas, offering range of up to 50km from an exchange. Intel's cagey dual-core CPU sneak peak was geared to provide us with the processing power to take advantage of next generation multimedia usage, while Digital Transmission Content Protection over IP (DTCP-IP) provides an engine for premium content delivery online and within the home. PlanetLab too links back to this idea of the home PC becoming so powerful you need go nowhere else to get any job done. Want to watch movies? Download them over a secure handshake authenticating media service over advanced and, more importantly, self-aware internet services and decode them locally. Hmm, now that'll require some mighty processing power, so you'll need a dual-core CPU. But you'll need to wait a while for 65nm variants as dual-core is going to debut in 90nm on the desktop and transition to 65nm at some point in 2007.

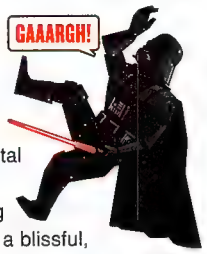
While the US and parts of Asia have been using Media Centre for a significant period of time already, we're yet to get ours. We also have a fairly low adoption rate of high definition television. Interestingly enough, once analog broadcast finishes in 2008 we should be set up with dual-core processors and on-demand internet media delivered by PlanetLab's efficient content streaming.

The digital age is well and truly on the way – and although it may not get here this year like Intel says, it is looking like everyone is investing a sizeable fistful of cash to get it off the ground. Intel's move to 65nm process technology may well serve a vital part in the building of the digital home, now we just need to wait on silicon.

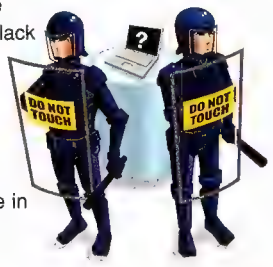
ShortCircuits

The question of when a piece of music is copyrightable has come into the spotlight again recently with the US 6th court of appeals ruling that a three bar sample from the 1975 Funkadelic song *Get off your ass and jam*, which was used in NWA's 1990 track *100 miles and running*, was covered by copyright. This was despite the fact that the already barely recognisable three bars were slowed down and looped. It has sparked worries of massive litigation and a whole new round of debate over what constitutes copyrightable music.

Apparently God hates MMORPGs and spammers. With Florida copping a rolling series of Hurricanes and Tornados of late it is not just the trailer parks that have been doing *Wizard of Oz* impersonations. Several datacentres were badly hit during the storms, with Star Wars Galaxies suffering some minor problems and Blizzard's World of Warcraft Stress test being put on hold for several hours while the server room was fixed. Florida is also home to a chunk of the world's spammers, and while the total impact is debatable, anecdotal evidence points to the storms choking back the spam for a blissful, but ultimately brief, moment.



Microsoft has been tweaking its hoopla machine for the launch of Windows XP Media Centre Edition (MCE) here in Australia, however it is now becoming clear that it will launch without one of the core components of the alleged digital media revolution, the Electronic Program Guide (EPG). Key to enabling television recording functionality, the EPG is used for easy scheduling of recording and other functions. While the OEM only nature of MCE means that it isn't really in the *Atomic* space anyway, this lack of EPG will impact the wider realisation of MCE's potential here in Australia.



Power Hungry

PSU mad Daniel Rutter voids a few warranties.

The original IBM PC's Power Supply Unit (PSU) had an aggregate output rating of 63.5W. It's now easy to find PC PSUs that can deliver almost nine times as much power.

Essentially, though, the latest 550W EPS12V PSUs are very similar to the old units. They're cheaper, they're less temperamental, they emit less radio noise and some of them are a *lot* prettier, but they get the job done in basically the same way.

The simplest kind of power supply that takes mains alternating current (AC) and outputs low voltage direct current (DC) is the 'linear' type, consisting of a transformer, a rectifier, and some capacitors, plus an optional regulator if you don't want its output voltage to vary much with load. Linear PSUs are big and heavy and inefficient, though; about four-tenths of the power going into one leaves as heat, not as useful output. Run a 300W stacked PC from a linear supply and you'll have to get rid of at least 200W of heat from the power supply alone.

To avoid this, PC PSUs are switched-mode, or switchmode, designs. Switchmode PSUs manage efficiency of 85 percent or better. Deliver 300W; waste 50W or less.

The components in a switchmode PSU that let it do what it does are Metal-Oxide Semiconductor Field-Effect Transistors, or MOSFETs. Transistors are solid state switches that can operate much faster than any mechanical switch; that's why CPUs are made out of transistors, not relays. MOSFETs are high power transistors; they can switch a lot of current. This makes them useful for power conversion.

Mains AC gets 'rectified' into DC after it enters a PC PSU, then converted back into AC again, at a much higher frequency than its original 50Hz. The device that does this is a 'chopper' inverter, probably with an output frequency of about 25KHz.

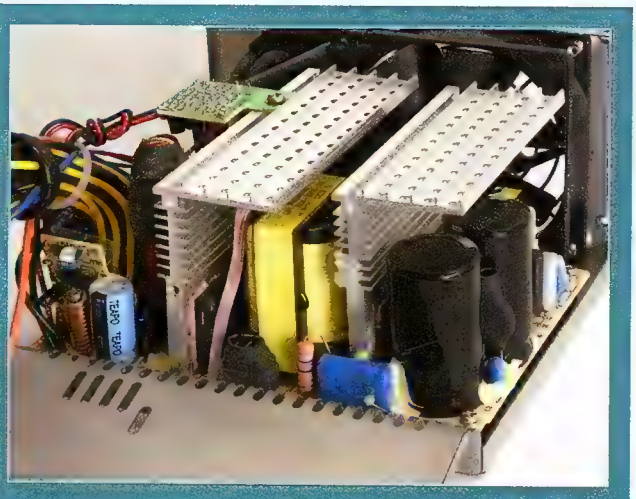
The chopper uses MOSFETs to regularly interrupt the input DC, giving an output signal that alternates between zero volts and full input voltage. Later components in the PSU can be given, one way or another, half of the input voltage as their 'ground' potential. This makes the output of the chopper work, as far as the rest of the PSUs are concerned, just like regular plus-minus-plus-minus alternating current.

The PSU needs high frequency AC because the next component in the chain is a transformer, and the higher the AC frequency, the smaller the transformer you need to use for a given power level.

Even a 500W PSU will have a main transformer in it that's only the size of a child's fist. If that transformer had to work at mains frequency, it'd be a multi-kilogram lump that filled most of an ATX PSU casing all by itself.

The transformer has a couple of taps on it – one for a bit more than 5V, and one for a bit more than 12V. A few PSUs have a tap for the 3.3V rail as well, but most just regulate down some of the 5V rail to make 3.3V. The 5V and 12V rails are also regulated, to pull them down close to their specified voltages.

This regulation's done by more MOSFETs, here used as 'switch-



ABOVE: This expertly bent AOpen PSU showing off its three primary components – the yellow-wrapped main transformer, the inverter and regulator MOSFETs and their aluminium heat sinks, and the big cylindrical smoothing capacitors.

ing regulators'.

Switching regulators don't actually change the voltage going through them. They just turn it on and off very quickly. Feed a switching regulator 20V and ask for 10V from it, and it'll rapidly pulse its output so that half the time its output is at 20V and half the time it's at zero. Do this fast enough, and put a capacitor or three across the output to smooth it out, and you get a nice clean 10V without ever having to just throw watts away as heat.

Linear regulators, in contrast, work like magically variable resistors; they're simpler and cheaper, but like linear power supplies, they waste a lot of power as heat.

Switching regulators and choppers aren't 100 percent efficient either, which is why power supplies have those chunky aluminium heat sinks inside them. At the bottom of each heat sink is a collection of MOSFETs.

Rails and ratings

The different voltage outputs of a PSU are often referred to as 'rails'. The three main power rails for a modern PSU are +3.3V, +5V and +12V; between them, they'll account for almost all of its power capacity. The next highest rated rail will be the +5VSB (standby) rail, which stays powered up whenever the PSU has mains power. The +5VSB will only account for a few percent of the total rating, though, and the negative rails (-5V and -12V, which are seldom used for anything in modern PCs) will account for even less.

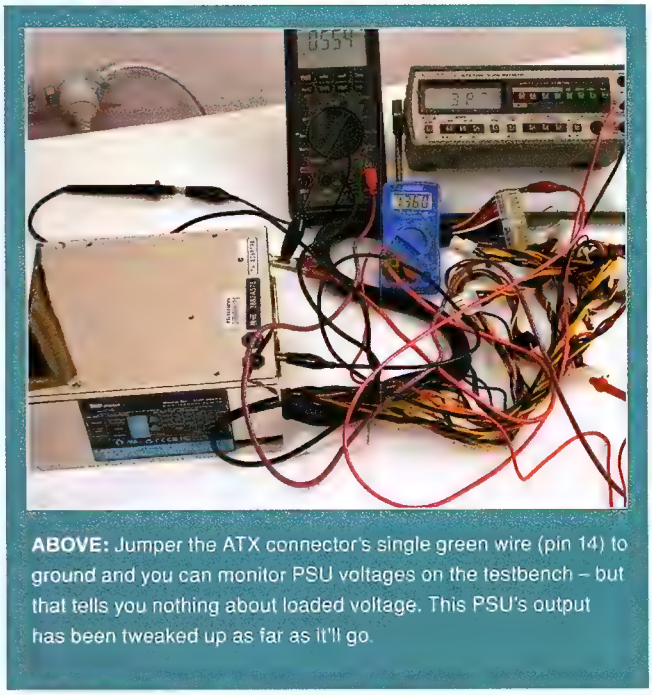
Because practically every PSU creates its 3.3V output by regulating down its 5V rail, 3.3V and 5V typically have a shared rating. 3.3V may have a 26 amp rating by itself, say (85.8W for DC electricity, watts always exactly equals volts times amps), and 5V may have a 28 amp rating (140W), but the two together may only be good for 200W. You'll only be able to load the 3.3V rail to maximum if you're asking for 22.8 amps, or less, from 5V.

Because all of the power rails come, ultimately, from one transformer, there's also an aggregate maximum power for 3.3, 5 and 12V all put together. Continuing the above example, 12V may be good for 30A by itself (360W), but all three power rails together may only be rated at 450W.

Very high PSU ratings are seldom important. If you're not running giant drive arrays or an amazingly overclocked CPU, a 350W PSU should be fine for any system. Extra capacity doesn't hurt; a computer that only needs a 300W PSU won't draw any more power if you give it a 600W one.

As power supplies approach their limits – and the spec sticker on the side may be a bit optimistic about the power a given PSU can actually deliver – they generally lose rail voltage. Most PCs are perfectly happy with slightly out-of-spec input voltages – 10 percent say – but when the input voltage sags much more than that, the computer can become unreliable.

If you want to see what your PSU's rails are doing, you can check them with the system monitoring utility of your choice (e.g, Motherboard Monitor, mbm.livewiredev.com) while you run software. This usually gives pretty accurate voltage numbers, and is always useful if all you want to do is see whether the voltage dips much when you do something, but you shouldn't rely on these readings completely. They're at the mercy of the hardware monitoring chip on your motherboard, and may be inaccurate, or even change significantly when you update the BIOS.



ABOVE: Jumper the ATX connector's single green wire (pin 14) to ground and you can monitor PSU voltages on the testbench – but that tells you nothing about loaded voltage. This PSU's output has been tweaked up as far as it'll go.

The voltages displayed in the 'PC health' menu in your CMOS setup program come from the same source, and are no more accurate – and you can't run software while checking them.

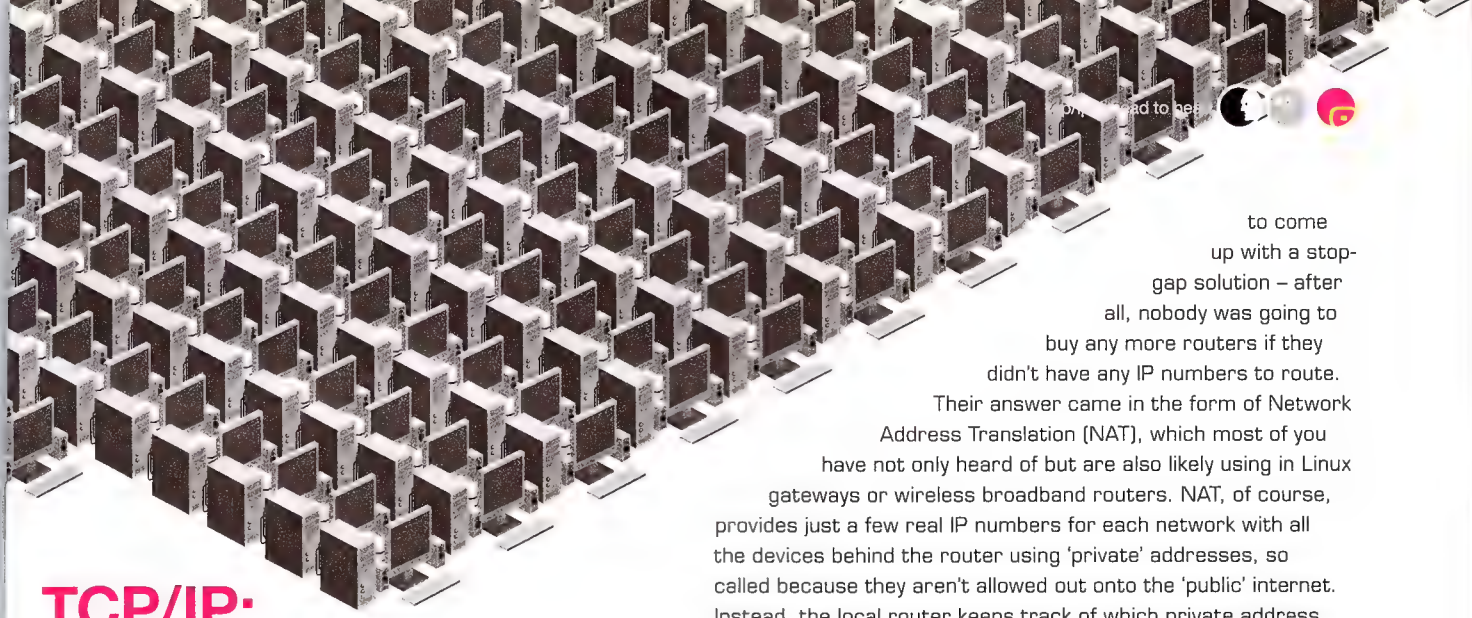
To get really accurate numbers, therefore, you have to hook up a voltmeter – or, preferably, a few of them, or a fancy multi-input multimeter, so you can monitor multiple rails at once.

There are several wires coming out of the PSU for each rail, and it doesn't matter which one you monitor. Pick whatever's most convenient. It's easy to keep tabs on +5V (red wires) and +12V (yellow wires) if you've got one spare drive power connector that you can poke your meter probes into. However, +3.3V (orange wires) is trickier. If your PSU has a six-pin 'AUX' plug that you're not using (you probably won't be; AUX connectors are usually only seen on server boards) then a paper clip poked into one of the orange-wire terminals on that plug will give you a monitoring location for 3.3V. Otherwise, you'll have to strip a bit of insulation on one of the main ATX connector's orange wires and hook up there.

Note that the above wire colours only count if you've got a standard power supply. If your PC is a proprietary machine all bets are off regarding wire location and colour.

Standard PSUs can be used in such computers, but only if you rearrange the plug wiring.

Note, also, that unless you've got a plastic PC case and/or a bunch of show-off lacquered components that don't make electrical contact with each other, the chassis of the computer and the power supply should be earthed. This means your negative multimeter connections can all go to any piece of chassis metalwork; you don't have to cram the negative probes into the drive power connectors too.



TCP/IP: The Next Generation

Ian Yates delves deep into the tech behind the Internet Protocol and where the next generation is going to lead us.

All geeks know that TCP/IP is the lifeblood of the Net, some even know that the acronym is a conjoining of two separate protocols known as the *Transmission Control Protocol* and *Internet Protocol*, and some even understand the arcane inner workings behind version 4 of the protocol (otherwise known as IPv4) itself. But there has been little on the coming revolution of IPv6, how it differs to IPv4, and just what it means for the future of the internet. So in true *Atomic* style, here's the lowdown and latest on the next-generation protocol known as IPv6.

First, a little history

Back when the World Wide Web was just the internet, only defence departments and academics were allowed to play, and at the time IP address blocks were handed out like candy. Some universities, for example, were handed entire 'Class B' address ranges for their own use – that's equivalent to 130,000 unique addresses, just for one university.

When the internet started to hit the corporate radar, private firms were given 'Class C' address ranges, equal to 255 unique addresses, even if they only needed 30 for all the machines in the business. No shortage of addresses was anticipated anytime soon, and no one really expected the explosive growth of the internet as it eventually happened.

Although IPv4 allows for a rather large number of unique addresses (almost 4.3 billion to be exact) the bottom line was that sooner rather than later the world would run out of unique numbers to hand out – in other words, a day would come when new computers simply would not be able to join and thus access the internet.

So in 1992 the Internet Engineering Task Force (IETF) began work in earnest on the next evolution of the IP protocol that would allow for a much *much* larger number of unique addresses. This super protocol became known as *IPng* (IP Next Generation), or IPv6.

Along came NAT

Before the IETF got very far however, real world pressures forced vendors of network gear to come up with a stop-gap solution – after all, nobody was going to buy any more routers if they didn't have any IP numbers to route. Their answer came in the form of Network Address Translation (NAT), which most of you have not only heard of but are also likely using in Linux gateways or wireless broadband routers. NAT, of course, provides just a few real IP numbers for each network with all the devices behind the router using 'private' addresses, so called because they aren't allowed out onto the 'public' internet. Instead, the local router keeps track of which private address ask for information, and then makes the external request using the router's public IP number. Suddenly, there were more than enough IP numbers to go around, particularly if those excessive handouts could be clawed back from organisations which didn't really need them any more.

NAT is one of the main reasons that IPv6, while complete now, hasn't yet spread as rapidly or as widely as predicted. But there are other challenges banging at the seams of IPv4 that will eventually combine, making the transition to IPv6 seem more reasonable. For that to happen, network vendors will need to be able to justify the additional expense involved, and their customers will need to be prepared to pay for the new features on offer. The rise in popularity of Voice over IP (VoIP) and technologies like iSCSI will help trigger changes, since the needs of telephony and storage bear little relation to the original design of IP to move data traffic in no particular order and no particular hurry. The increasing concerns about security and feverish schemes to combat spam will also add pressure towards a switch to IPv6, which promises to raise authentication to a higher level than is currently possible with IPv4.

Additionally, the realisation of intelligent networkable devices that could soon include TVs and frivolous inventions like internet fridges may start gobbling whatever remaining address space exists in IPv4. The jury is out on whether every home will have its own router, even though many Atomicans have at least one already. In the same way that the rise of digital cameras has driven sales of photo printers into homes that haven't got a single PC, internet-connected TV sets will likely be in every home, regardless of whether there is a PC nearby. That eventuality will raise the number of devices clamouring for an IP number by an order of magnitude.

IPv6 was designed to be an evolutionary step from IPv4 rather than a radical replacement. After all, when you're dealing with the vast internet, you can hardly ask everyone to shutdown for a few days while you upgrade everything. That approach doesn't even work in networks of a few hundred PCs. Instead, IPv6 was designed to interoperate with IPv4, which unfortunately means more expensive hardware and software in each IPv6 capable device until all the old IPv4 devices fade away.

Mind-bogglingly big

So what's inside IPv6 that will entice us to switch? IPv6 uses 128-bits to specify an IP address, compared

to the 32-bits of IPv4. Therefore IPv6 can support more levels of addressing hierarchy and a vastly increased number of uniquely addressable devices. IPv6 also provides for simpler auto-configuration of addresses. To get a glimpse of what 128-bits vs 32-bits means in terms of available addresses, it's roughly four billion times four billion times four billion times the size of the IPv4 address space. Or, in other words: 340,282,366,920,938,463,463,374,607,431 billion unique addresses. Compare this to just 4.3 billion offered by IPv4. Yeah, *big*. So massive in fact thatfantasize theoretically every square metre of the planet could be assigned 665,570,793,348,866,943,898,599 addresses.

Aside from size, provision was also made to improve the scalability of multicast routing by adding a 'scope' field to multicast addresses. A new type of address called an 'anycast address' was also defined, to identify sets of nodes where a packet sent to an anycast address is delivered to one of the nodes. The use of anycast addresses in the IPv6 source route allows nodes to control the path to which their traffic follows. Some IPv4 header fields have been dropped or made optional, to reduce the common-case processing cost of packet handling and to keep the bandwidth cost of the IPv6 header as low as possible despite the increased size of the addresses. Even though the IPv6 address notation is four times longer than that of IPv4 addresses, the IPv6 header is only twice the size of the IPv4 header.

Architectural changes

Changes in the way IP header options are encoded allows for more efficient forwarding, less stringent limits on the length of options, and greater flexibility for introducing new options in the future. IPv6 options are placed in separate extension headers that are located between the IPv6 header and the transport-layer header in a packet. Most IPv6 extension headers are not examined or processed by any router along a packet's delivery path until it arrives at its final destination. This facilitates a major improvement in router performance for packets containing options. In IPv4 the presence of any options requires the router to examine all options.

The other improvement is that unlike IPv4 options, IPv6 extension headers can be of arbitrary length and the total amount of options carried in a packet is not limited to 40-bytes. This feature plus the manner in which they are processed permits IPv6 options to be used for functions that were not practical in IPv4. A good example of this is the IPv6 Authentication and Security Encapsulation options.

Additonally a new capability has been added to enable the labelling of packets belonging to particular traffic 'flows' for which the sender requests special handling, such as non-default quality of service or realtime service. In other-words, in-built bandwidth prioritising. Think better VoIP or gaming streams without dropouts. IPv6 also includes the definition of extensions that provide support for authentication, data integrity, and confidentiality. This is included as a basic element of IPv6 and will form part of all IPv6 implementations.

IPv4 addressing and IPv6 equivalents

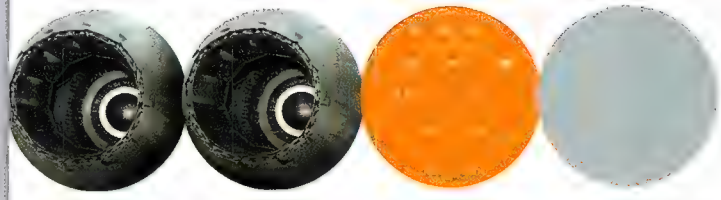
IPv4 Address	IPv6 Address
Internet address classes	Not applicable in IPv6
Multicast addresses (224.0.0.0/4)	IPv6 multicast addresses (FF00::/8)
Broadcast addresses	Not applicable in IPv6
Unspecified address is 0.0.0.0	Unspecified address is ::
Loopback address is 127.0.0.1	Loopback address is ::1
Public IP addresses	Global unicast addresses
Private IP addresses (10.0.0.0/8, 172.16.0.0/12, and 192.168.0.0/16)	Site-local addresses (FEC0::/10)
Autoconfigured addresses (169.254.0.0/16)	Link-local addresses (FE80::/64)
Network bits representation: Subnet mask in dotted decimal notation or prefix length	Network bits representation: Prefix length notation only
DNS name resolution: IPv4 host address (A) resource record	DNS name resolution: IPv6 host address (AAAA) resource record
DNS reverse resolution: IN-ADDR.ARPA domain	DNS reverse resolution: IP6.ARPA domain

Looking to the future

There are several reasons why IPv6 is a good choice for the next generation of the Internet Protocol. It provides for a massive up-scale for the internet, offers a flexible transition from the current infrastructure, and was designed to meet the needs of new markets such as PDAs, networked home entertainment, and intelligent networked devices. It's designed to make the transition in an evolutionary way that reduces the risk of massive forklift upgrades or major outages while ISPs make the conversion. That said, it will still cost real money to implement, so most users won't see IPv6 until they need a new gadget or system which happens to support the new protocol. There are a lot of devices out there that don't really need replacing.

Although IPv6 has been well designed, the current IPv4 seems to have sufficient longevity to remain with us for some years to come. Most analysts predict that IPv6 will take as long as a decade to rise to prominence, and even the vendors that support the new protocol, such as Cisco, HP and Microsoft, haven't made the switch internally. However, all it takes is an unforseen reason to arise forcing ISPs to support IPv6 and suddenly the move will come sooner than predicted. In other words, if ISPs stand to lose money unless they switch, they will do so in an instant. Until then, IPv4 will still faithfully serve us well.

Maintain the sting in the Hornet's tail.



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SULU SPEAKS

Logan Booker goes trekking with The Original Series' Hikara Sulu – otherwise known as his ever-charismatic alter ego George Takei.

LEFT: George Takei fills *Atomic* in on his Sulu life (far left), venturing forth into space and trekking the final frontier.

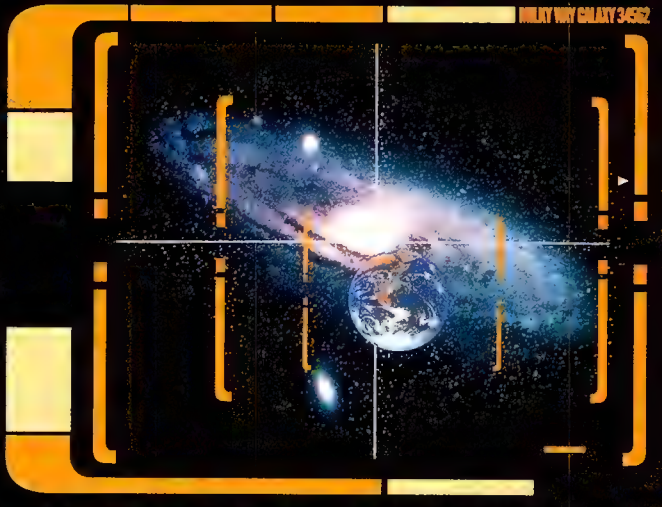
FULL NAME: SULU, HIKARU
BORN: 2237
ORIGIN: HUMAN
PLACE OF BIRTH: SAN FRANCISCO, EARTH
RANK: HELMSMAN

Star Trek, for almost half a century, has remained incredibly symbolic to the generation that watched it – not only for its science fiction kookiness or optimistic outlook on humanity's future, but also for its strong racial and political messages: messages that were always forward-looking, inspirational, and at the time, unbelievable. While it might have been difficult during the 1960s to realise exactly how radical *Star Trek* was, in hindsight it's amazing to see how prophetical it actually became, at a time when global relationships were stretched and countries were on uneasy footing with their neighbours.

Atomic was lucky enough to catch up with *Star Trek*'s Mr Sulu, George Takei, and ask him a few questions about his time on *Star Trek*, and his work with Gene Roddenberry, the series' creator. *Atomic* was also given an insight into his experiences during World War II.

When you were on *Star Trek*, did you ever get the feeling you were a part of something that was going to go big?

I knew that it was a breakthrough both in terms of the show as well as for me as an individual actor. I went into the interview and Gene Roddenberry started to describe what the show was about. From talking to Gene, it was clear he saw television as a much more potent medium than what it was being used for.



[At the time, watching television] simply involved people sitting back [with a] can of beer in their hand and absorbing the entertainment. [Roddenberry] felt that this medium could be used to stimulate, inspire and activate people – rather than just sitting around and absorbing entertainment.

[Roddenberry] wanted to project, first of all, our future as a good one, a positive one. And it can be that we have confidence in our problem solving capabilities, our inventive genius and our creativity.

He wanted to use science fiction – genuine science fiction – as opposed to so much that was being fobbed off as science fiction at the time – you know, fairy tales in space, *Lost in Space*, that sort of thing.

'To be sent to swamps and imprisoned by barbed-wire fences and sentries with machine guns was a devestating experience.'

- George Takei

He said science fiction is a literary genre and he wanted to approach it as that. In that, he pioneered.

He [also] said he wanted to use science fiction as a metaphor for social, cultural and political issues of the time. He started describing the general format – the Starship Enterprise was to be a metaphor for the Starship 'Earth'. And the strength of that starship was in its pluralism – people of diverse backgrounds, experiences and histories, coming together and taking the best of that diversity and working in concert as a team so that you could overcome almost any daunting challenge. He wanted to see my character as representing the Asian part of that diversity.

But that diversity also incorporated political diversity. At that time, back in the Sixties – that was the time of the Cold War, when two great powers, nuclear powers – were threatening each other with mutual annihilation. At that time, he included as part of our leadership team a trusted member that was proud of his Russian heritage and spoke with a Russian accent, Pavel Chekov. So the message there was that even then, the Cold War was going to be a part of our lives. The Berlin Wall was going to be there in perpetuity and his view was that this too would come to pass and that we [would] be able to work in concert. In many ways it was quite prophetic – today we have an international space station up there, we hear Russian accents working in concert with American accents; last month I heard the Japanese astronaut Mohri – he speaks English fluently but

ABOVE: Hikaru Sulu (far right), Starfleet Officer and helmsman on the USS Enterprise.

with a discernable Japanese accent. We've had Israelis up there. Back in the 1960s, that was pure political science fiction and I was to be a part of that statement.

Up until then, Asian characters and Asian-American characters were depicted on American television and movie screens in a pretty shallow, two-dimensional stereotype. And here he was describing my character as being part of a leadership team – having qualities that were heroic, working with all the others. The larger vision, plus the way he characterised the role I was to play was a breakthrough on every level. It is a compliment, considering his intelligence, good taste and discernment, that Gene Roddenberry cast me as Sulu.

Are you yourself a big fan of science fiction, or science in general, and do you try to keep up-to-date with breakthroughs and such?

Prior to *Star Trek*, I read Ray Bradbury and was engrossed in his writing and imagination – but no, I must confess I was not a science fiction fan until I got involved in *Star Trek*. The people who write the scripts, people like Harlan Ellison and Norman Spinrad, make you say 'Wow, these are interesting people – let's see what they do.' And you read their books and you're engaged by them.

However ... I don't get to do too much reading, only when I'm flying in a plane.

Being the first Asian character on TV in a major, respected role, did you feel that you had an important part to play for multiculturalism in the US?

Yes. That is key to Gene Roddenberry's vision and also to my own personal history.

When World War II broke out, the US government couldn't draw the distinction between American citizens – my mother was born in Sacramento California, my father was a San Franciscan and I was born in Los Angeles. We were Americans – yet our government couldn't distinguish between American citizens of Japanese ancestry and the Japanese nation with which we were at war. Simply because we happened to look like the enemy they rounded us up – now I was too young to understand it but I do remember when soldiers with guns came to our home. They unnetted the guns to order us out of our homes and initially they took us to a horse stable at a racetrack and had us housed there while the camps were being built. There were 10 of them built in some of the most godforsaken places in America. After a couple of months in the horse stables my family and I were sent out on this train across the American south-west to the swamps of Arkansaw.

For me, because I was as young as I was, it was a fantastic adventure. But for my parents it was the most harrowing experience to lose everything that you had – business, home, freedom. And the way in which they lost it – the vultures are out in front of the house, waiting for us to be taken away. And when we were taken away they came and pillaged our homes. I was four years old then, my brother was a year younger, my sister was a little baby, and my parents had to take these children and live in this horse stable, which for me I remember as being fun – we got to sleep where the horsies sleep. But for my parents it was the most shattering experience. Then, to be sent to these swamps and to be imprisoned by these barbed-wire fences, guard towers with sentries and machine guns pointed at you, it was a devastating experience.

Because we had that experience – and it didn't happen with German Americans or the Italian Americans – we were at war as well – it was just that we were racially identifiable that we were incarcerated.

My father felt that it was very important that we be active participants in the democratic process. He firmly believed in the ideals, the stated ideals, of American democracy – the irony is that I learned how to pledge allegiance to the flag when I was in the interment camp in Arkansaw, and our pledge of allegiance ends with 'Liberty and justice for all' – and I can see the barbed-wired fence and the guard towers right outside my kindergarten barrack. So my father urged all his children to get out there and be active and to participate. I was active in democratic politics – I was a national delegate in 1972, 1974 and 1976. I've served on many civic commissions and boards.

In many ways my father's philosophy was a perfect fit with Gene Roddenberry's philosophy. He guided us to be active and full participants in the pluralistic American political process.

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1. What was the name of the female actor that played Dr Roger Korby's assistant in the episode *What Are Little Girls Made Of?*

2. What does Harry Mudd say his name is when Kirk first meets him?

3. In which episode did Kirk first say 'Beam me up Scotty'?

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The genesis of a genre

We love games for the entertainment they bring to our otherwise normal lives. Surreal worlds, alien invasions, world wars – games have the power to make them real. First person shooters have led the way in many regards, but at what cost? Logan Booker delves into the lives of the giants behind the revolution that is the FPS.

Drop your mouse and move away from your keyboard. Let go of reality and imagine the entire genre of the first person shooter does not exist. Erase it from your memory.

Having trouble? Here's some food for thought.

There is no id, no Carmack, no Romero. No Doom. Epic Megagames is renowned for its seminal platformer Jill of the Jungle. Blue Sky Productions' Ultima Underworld never sees the light of day and consequently, there is no Looking Glass Studios. Raven is stuck developing crummy action games, Valve was never founded, Gabe Newell stayed with Microsoft, and 3D Realms is still Apogee.

Fun, at least in this world, has been expelled from the industry like *steam* from a release *valve*.

The developers behind those original, truly revolutionary games are as intangible as the intellectual property they created – while the engines live on, the developers are forgotten.

But it's easy to paint an apocalyptic picture of a games industry minus its leading lady, barren of innovation, considering the massive influence it has had.

FPS games are the beating heart, the flawless gem, of computer entertainment. They are the powerhouse money makers of the games industry. Every year the genre delivers a new revolution in graphics or gameplay innovation, while preserving its heritage in the only way it can – the use of a first-person perspective. FPS is gaming's greatest success story, the industry's *Iliad*.

Success however, always has its wicked way with the humble.

With exception of people like John Carmack and Peter Molyneux, the developers behind those original, truly revolutionary games are as intangible as the intellectual property they created – while the engines live on, the developers are forgotten.

The days of 'John Romero's Daikatana' and 'Sid Meier's Civilization' are truly over. Design is a process – a step – not law, and the industry is now the domain of a select few big name publishers and developers.

So then, where did everyone go?

Gobble-gobble

During the nineties, there was a mass consolidation of game studios and publishers – it's perhaps the biggest reason why today's industry is as desolate as it is.

The Nineties, arguably the golden age of gaming when hits such as Quake were blossoming on the market, was a busy time for both gamers and businesses. Infogrames, who many will fondly remember as the grandfather of the survival horror genre thanks to its stellar Alone in the Dark series gorged itself on the likes of Shiny, Psygnosis, Gremlin, Ocean and Accolade. These acquisitions however pale in comparison to Hasbro, which Infogrames devoured back in January of 2001. Hasbro itself had been busily munching on MicroProse and ironically, Atari.

For a time, Infogrames and GT Interactive were the players in the industry – in the PC space anyway – up until Infogrames acquired GT in 1999.

May 2003 saw Infogrames change its name to Atari - a change that to gamers may have made sense, but to everyone else was bizarre. Atari, while it was a strong brand, was not a strong company – in 1998 it was sold to Hasbro for only US$5 million, a victim of its own frivolous spending and poor market decisions.

Technically, many developers are still around – they're just not independent. If you scratch under the surface of just about any big name publisher, you'll find traces of old and familiar studios. But, while studios can be easy to chase down, people are a little harder.

FPS: A Tragedy

The history of first-person shooters is as much filled with grand success as it is littered with broken promises and wasted potential.

During an IRC chat session five years ago, 3DRealms' Scott Miller bravely predicted Duke Nukem Forever would be the best selling game of 2000. At that time, DNF had been in development for four years, bringing total development time to almost nine years today.

Nine years ago, Tom Hall, William Scarboro and Jim Dose started work on Prey – a game that would never be published, let alone finished. Prey burnt through a lot of developers, including its original lead Tom Hall, his replacement, Paul Schuytema, and Paul's replacement Corrinne Yu, not to mention a substantial quantity of programmers, level designers and artists.

Twelve years ago, a sprightly 17-year old Ken Silverman began coding Build, the engine that would later power Duke Nukem 3D and Blood. Both teams that worked on these games were as paranoid as hell that one would steal ideas from the other.

A massive 13 years ago, Tom Hall penned the original design document for Doom, a design document that, for the most part, was ignored when Doom was developed, and, 14 years ago, Origin Systems Incorporated published Ultima Underworld, the first game to use proper 3D – a game that technically was light years ahead of Wolfenstein 3D, released a year later and Doom, released two years later.

However, Underworld is hardly considered today as a pioneer of 3D FPS gaming, and is one of many innovative titles unintentionally shoved into the background of FPS history.

Brave new underworld

Doug Church, who worked as one of the main programmers on Ultima Underworld and later as the project lead on System Shock, still remembers his time at Blue Sky Productions during development of Underworld. All 22 months of it.

'At the beginning, we didn't have a schedule as Origin didn't seem to think we could do it ... I doubt we thought it would take that long though,' says Church, now technical director at EDIOS Interactive.

Underworld, a role playing game based in the Ultima universe created by Richard Garriott, put the player in the shoes of Garriott's 'avatar' on a quest to save a princess. A little known fact is that Blue Sky approached Origin, who then supplanted the Ultima world into the game.

The technical concept was the brainchild of Blue Sky's Paul Neurath, who believed that a RPG built using a 'simulator' like engine had a lot of potential. So, in May 1990, work began on the engine and Dan Schmidt, who would later go on to code Terra Nova: Strike Force Centauri, a squad-based title with an emphasis on tactics, for Looking Glass Studios, joined the fray.

'The team was mostly brand new, so we certainly had a lot to learn. We were pretty much just designing as we came upon issues in blending flight-sim and dungeon crawl, so there was a lot of fairly open-ended "Well, that didn't work, try again" kind of rework. I don't think of that as a problem though, not at the team size of the time,' says Church.

But Underworld was an ambitious project. 'We had an engine that tried to do more visually and thus required faster hardware [than Wolfenstein 3D, id's famous claim to FPS fame] and had more issues – though it also had more possibilities,' explains Church.

'We probably had a smaller market

of HW [hardware] in the first place, but more relevantly, we had a much less focused game.'

Wolfenstein 3D and Underworld appealed to different audiences – one was just larger than the other. Church also notes that id's Carmack always made good compromises between advanced technology and hardware expectations.

'[id's] work had a huge impact on tons of people [and their] perception of 3D games ... [it] deserves to be remembered as a pivotal game as far more people played, looked at and remembered it and its descendents than people remember the few games of the type we did.

'I certainly hope we influenced some players and developers, but really, the main goal is just that a lot of players had a lot of fun.'

Breaking new ground

Shortly after the release of Ultima Underworld, Blue Sky Productions changed its name to Looking Glass Studios. Under this new name, the company produced its most enduring classics – System Shock, a title with a brilliant mix of terror, sci-fi and RPG; and Thief, a sword-fighting sneaker that encouraged the player to hide, not kill. LG also developed Terra Nova: Strike Force Centauri.

Terra Nova, while arguably as innovative as the aforementioned titles, ultimately didn't make the final cut.

'Terra Nova was very late,' explains Jonathan Chey, managing director of Irrational Games down in Canberra. Chey, a 10-year veteran of the games industry, was snapped up by Looking Glass to fulfill a role as an AI programmer. At that time, Chey had just completed his PhD in Cognitive Science at Boston University in the US. 'It was a dream come true and the luckiest break I've ever had,' says Chey.

Irrational worked with LG during the development of System Shock 2, sharing the technology behind Thief to produce the sequel. Like System Shock, Terra Nova was a foray into the realm of the sci-fi shooter, but, like all Looking Glass games, it wielded a depth of gameplay not found in competing titles.

'I think it took around four years to build – by which time the engine was already looking quite dated. It did do some nice things like drawing terrain to the horizon rather than using a static backdrop, but overall it just couldn't compete against other technology that was around by the time it was released.'

There was no lack of competition in 1996 – the year the game made it to stores – and included 3D Realms' Duke Nukem 3D that took the 'babes and big guns' legacy of the platformer and made it 3D; Raven's Hexen, a Doom-based shooter with swords and magic; Bethesda's Daggerfall, a deep RPG set in a massive, dynamic world, and of course, id Software's Quake.

'The rather backwards technology was a problem, for sure ... it [also] wasn't properly marketed and I don't think people understood what was interesting and different about it,' says Chey.

Perhaps the most unfortunate by-product of Terra Nova's legacy is Dan Schmidt. As mentioned earlier, Schmidt worked on Underworld as a programmer, alongside Doug Church and Paul Neurath.

'Dan was definitely the driving force behind Terra Nova. So much so that I think he burned out a bit on it. [It] might be part of the reason why he left Looking Glass soon after and went to work at Harmonix'

'Nice guy, smart guy – [a] good person to work with,' says Chey.

Thief in the night

Terra Nova was by no means the last game to come out of Looking Glass. In 1998, the company graced the FPS world with Thief – a game many believe was the catalyst for the genre of the 'first-person sneaker'. Thief was developed using Looking Glass' Dark engine, created in-house by the duo of Sean Barrett and Doug Church.

ABOVE: Ultima Underworld was in part the work of EIDOS' Doug Church, as was System Shock.

'LG was ideologically opposed to licensing technology. They felt that they could do better than anyone else. That's what made their games so unique,' says Chey.

'In retrospect I think it hurt the company ... Looking Glass was very resistant to copying ideas from other companies, too much so in my opinion. It did result in a lot of innovation but also, I think, kept them from keeping up with good ideas that other people had.'

To demonstrate, Chey uses the example of LG's default key configuration. 'For a long time LG insisted on defaulting their movement keys to ASDX instead of the industry standard WASD. There was no doubt some highly compelling reason, but it is foolish to violate an industry-wide standard like this in my opinion.'

In the case of Thief, violating standards was wise. The game, originally called 'Dark Camelot', was to be a relatively straightforward 'sword-fighting simulation' that made use of proper physics to enhance its realism. Chey compares Thief's earlier concept for combat to that found in another game, Die by the Sword, where the mouse was representative of the player's sword arm.

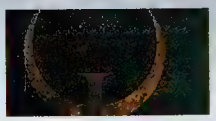
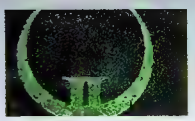
'For some reason, this concept never really got off the ground and the game got turned into a "sneaker",' says Chey.

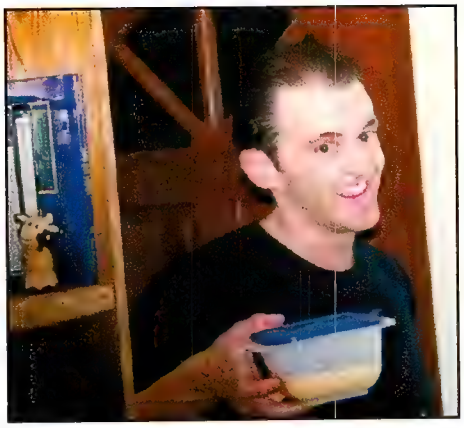
'The actual moment that happened was late one night in the programming pit when LG CEO Paul Neurath just came up with the idea out of the blue. I think everyone immediately recognised that it was a great idea and the whole project shifted gears.'

Chey admits that it wasn't clear whether the concept would actually work. In fact, the only time he remembers having fun playing Thief was a few weeks before the game was completed.

To its credit, Thief has spawned two sequels – The Metal Age and Deadly Shadows. The Metal Age was the last Thief title to be developed by Looking Glass, and Deadly Shadows, released in May of this year, was made by ION Storm.

'Thief itself wasn't a huge hit – as is often the case with this kind of innovation, it's someone else who comes after who manages to take the proven

Wolfenstein 3D era (1989-1992)	Doom era (1993-1994)	Original Quake era (1995-1996)	Quake 2 era (1997-1998)	Quake 3 (1999-2001)	Doom 3 era (2002-2004)
					
Ultima Underworld Ken's Labyrinth	System Shock Terminator: Future Shock Rise of the Triad Heretic	Prey Terra Nova: Strike Force Centauri Duke Nukem 3D Blood Shadow Warrior Spec Ops: Rangers Lead the Way Daggerfall Dark Forces Hexen	Unreal Dark Forces 2 Hexen 2	Unreal Tournament System Shock 2 Thief Thief 2	Morrowind Unreal Tournament 2003 Unreal Tournament 2004



ABOVE: William Scarboro played a key role in the development of both Prey and Rise of the Triad. His death was a big loss to the industry.

Ironically, Irrational's first game would be a co-operative venture with the founders' old home of Looking Glass.

'We were originally asked by Looking Glass to propose a science fiction shooter that used the Dark engine. It was our idea to try to latch onto the Shock universe and then it was just fortuitous that EA [Electronic Arts] saw fit to back it,' explains Chey.

'Ken Levine was the lead designer on Shock 2, but Rob Fermier and myself pitched in and contributed, as did pretty much everyone on the team. The original Shock was likewise created by a bunch of people, but Doug Church stands out as the "big brain", I think.'

Sadly, System Shock 2 would be one of the last games Looking Glass worked on. Shortly after Thief II hit the shelves in 2000, LG closed its doors and its IP was sold. Electronic Arts already had the rights to System Shock, but EIDOS bought Thief and since then, has released one game using the license.

'It was a very sad day for the industry,' notes Chey. 'On the other hand, I'm glad Irrational survived and picked up some of the pieces, as did ION Storm Austin ... at least 10 [Looking Glass employees are here] I think, though I haven't counted.'

Although innovative titles, Chey believes neither Thief nor System Shock 2 sold more than three or four hundred thousand copies.

'Respectable numbers, but not enough on their own to sustain the business,' says Chey. 'They had a string of critically acclaimed but commercially flat projects, all of which went over-budget and over-schedule.'

'It was a sad end for such a great company,' says Chey.

Ultimately, innovation was not enough to keep the company afloat, a fact that continues to be true today.

mechanic and spin it into something more polished and commercially successful.'

Shock to the system

It was during the development of Thief that Chey left Looking Glass, along with Ken Levine and Rob Fermier, to start Irrational Games.

A combination of frustration over a failed Star Trek game, some sales shenanigans with Terra Nova and British Open Championship Golf, and an admitted splash of presumptuousness, convinced the three that they could start their own company and make good on certain design philosophies they believed were important.

A kiss to Build a dream on

It's March 1993, and a young Ken Silverman is at his computer, fingers perched lovingly over the slick, beige plastic of his Key-tronic 101 keyboard. It's a normal day in East Greenwich, Rhode Island, but only if by 'normal' you mean 'crazy as hell' – one day it's raining, the next it not. Even the weather bureau has trouble predicting it.

But Ken doesn't care. It's time to program. And in March 1993, Ken began coding what was to become Build.

'I started researching Build soon after I released Epic's version of Ken's Labyrinth – which I think was right around the time id [Software] started hyping its initial specs about their upcoming Doom game ... I was 17,' says Silverman, now 28 and still living happily in Rhode Island.

'Build started like any project of mine. It was just another programming challenge that I would use to impress people.'

Silverman's website best proclaims his love for the coded word. 'For me, programming is not just an interest or a hobby – it IS my life,' it states in vibrant yellow Times New Roman. Dig deeper and you'll find more than 60 hand-coded programs are available for download, including the source to Build as well as Ken's Labyrinth.

'With Ken's Labyrinth [a basic Doom-clone] finished, and Epic offering me a deal I wasn't happy with, my dad convinced me to send a demo of Build to Apogee Software. I sent them a demo of Ken's Labyrinth a year before – and they responded warmly,' says Silverman.

In August of 1993, Silverman received a bug fix and feature request list for Ken's Labyrinth from George Broussard, Apogee's CEO and, later that month,

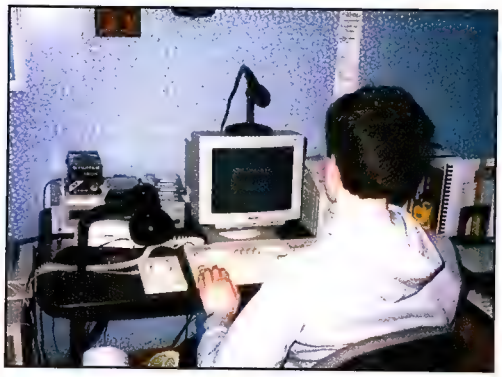
Silverman signed a contract with Apogee to develop Build.

Build however wasn't the only thing Silverman had on his plate.

'During all this, I started my first semester at college. In order to make my parents happy, part of my contract with Apogee said that their work couldn't interfere with my education.

Despite this, Silverman only passed two of his four courses that semester. He doesn't blame Apogee however for his lack of academic application. 'Soon after seeing my first report card, it became obvious to my parents where my interests [were]. So, they "allowed" me to work for Apogee full-time.

'Yeah, I know what you are thinking – I should have been making my own decisions. But I not that way. I have social issues,' admits Silverman.



ABOVE: Ken Silverman in his 'office' at home, and ION Storm's Tom Hall at E3. Silverman travelled all over the US while working with 3D Realms on Duke.

During his tenure working for Apogee, Silverman spent a considerable amount of time travelling between Rhode Island, Garland in Texas and Redmond in Washington. Silverman spent almost 300 days away from home, working on games based on Build including Duke Nukem 3D, Blood; a spooky horror title packed with zombie goodness; and Shadow Warrior, a game that cast the player in the role of 'ninja assassin' Lo Wang.

Although Silverman spread himself across a lot of 3D Realms' Build-powered titles, he spent a majority of his time on Duke Nukem 3D. 'I worked mostly with Todd Replogle [3D Realms programmer] and Allen Blum [level designer]. I have a lot of respect for those guys.

'Todd must have worked 20/7 programming for three years straight. Nobody questioned his work ethic. He was so optimistic; we knew he was lying half the time, but whatever he said – it worked, because it motivated everyone else to work harder.

'Allen was perhaps the most creative guy on the project. He did his work quietly. It was fun just to watch him use the Build editor. Many of the tricks you see in the game are to his credit,' says Silverman.

Silverman also spent some quality time with 3D Realms' chief George Broussard, staying at his home for the first few weeks of his run with Apogee while the company arranged somewhere for him to live.

'I probably ate more pizza and hamburgers during those two weeks than any other time in my life,' recalls Silverman.

However, things were not always so breezy. Silverman was approached a number of times by both Broussard and Scott Miller, 3D Realms' owner, regarding the lowering of his royalty rates.

'[It's something] I was not particularly pleased about. They asked because they wanted to give a share to all of the new people they had hired during the project,' says Silverman.

Another figure Silverman recalls was Duke's producer, Greg Malone.

'I could never figure out why they hired [him] ... I guess he was there to keep the artists busy, but to the programmers, he was just reminding us [of things] from his big "list" that we already knew about. George was the real producer/director throughout the project,' says Silverman.

Ken Silverman's career in the games industry came to an end in December of 1996, when, after spending almost three years away from university, he parted ways with Apogee and returned to studying. Duke Nukem went on to be the hit of 1996.

Asked if he had any regrets: '[They] would have to be those features I never had a chance to implement – and the fact the game couldn't be released sooner.'

Prey day

While work went on with Duke Nukem 3D, another project was bubbling under the surface at Apogee/3D Realms.

'In 1994, they asked me to start working on a next generation engine.... I called it "Polytex". I never got far with it though. It was just a generic BSP-renderer that displayed Build maps,' says Silverman.

3D Realms was chasing the next big thing – it just wasn't sure what that big thing was.

A number of developers during the period of 1994-1998 were working on next generation tech – id Software had Quake and Quake 2 and Epic had Unreal. Although 3D Realms was confident Duke Nukem 3D would blow the socks off the gaming community, the technology had roots in an era that was nearing extinction – the era of 2D.

Duke3D wasn't the only game 3D Realms was developing in 1994. The 'Developers of Immense Power' – Tom Hall, Jim Dose and William Scarboro, among others – as they were known at the time, were coming off the Wolfenstein 3D-based Doom-clone Rise of the Triad. ROTT originally started out as a sequel to Wolf3D, but somehow morphed into a trippy, action-packed shooter grounded in its own unique world.

Like most of the titles members of that team would go on to develop, ROTT suffered at the hands of poor timing, feature creep and backwards technology. The exception to this rule is Jim Dose, who now works at id Software.

'I didn't hang around with the ROTT team much,' says Silverman. 'They were in a separate office, and like the Blood team, had paranoia [in regards to] features being stolen from the other game. This was caused by the fact that team

members profited only from the sales of their own game,' explains Silverman.

One such feature was one Silverman programmed himself – the ability to look up and down in Duke3D. A mere three days after it was coded it found its way into ROTT, and its team received the credit. It didn't take long before it appeared in other Doom-like games, long before Duke3D hit shelves.

With ROTT out of the way and idle hands as a result, work commenced on Prey in 1995 – its development headed by Tom Hall. Hall had previously worked at id on Doom, writing up the game's first design document.

In recent years Hall has dropped off the gaming radar, his last notable appearance being at ION Storm Dallas – the company he co-founded with John Romero – working on Daikatana and Anachronox.

Prey was to be a revolutionary title. Featuring a Native American captured by an alien species and enhanced with biological implants as the protagonist, players were required to master six combat disciplines in order to complete the game.

This concept however changed radically during Prey's development.

Tom Hall worked on Prey for a mere 12 months before leaving the company along with Jim Dose and a number of other DIPs in August of 1996.

The departure of such key players from Prey's team was the first indicator that something was not right at 3D Realms. It would serve as the starting point of the company's downward spiral into the airtight 3D Realms of today.

BELOW: Prey's second project lead, Paul Schuytema. Of all the leads, Schuytema was with the project the longest, working with 3D Realms for almost two years.

Paul Schuytema was brought in to replace Hall as Prey's project lead. At that point, Schuytema already had a firm grasp of games and game development, having written for numerous well known computer magazines and websites.

'I was with Prey for a touch over two years,' says Schuytema, who now resides at Magic Lantern Games, a games company he founded in 1998 after leaving 3D Realms. Posed with the question of what happened to Prey, Schuytema is honest about the problems he faced at 3D Realms.

'It's not all that complicated. One aspect is that we decided to move the 3D rendering from Glide to DirectX [having already moved from software to Glide]. That was a very hard decision to make, but in hindsight, it was absolutely the right one.

'During the transition, the game engine was in pieces for far too long – that, understandably made Scott [Miller] and George [Broussard] very nervous, since we still weren't 100 percent confident in the move to DirectX,' says Schuytema.

According to Schuytema, the technology was also not as robust or advanced as it needed to be. Consequently, this made the development of new and exciting elements a tricky proposition. In addition, 3D Realms was under pressure from publisher GT Interactive, who had suffered from the delayed release of Epic's Unreal, to get Duke Nukem Forever finished.

Direct ties

The LithTech engine created by Monolith originally started life as a collaborative project with Microsoft. With the introduction of DirectX back in 1995 came a need to take advantage of its features – what better a project to do this than a fully realised 3D FPS engine? So began 'DirectEngine', named obviously for its ties to DirectX, and Monolith started work on Riot, a Mechwarrior-like mech robot FPS.

Development went on cheerily until April 1998 when out of the blue came a press release from Monolith, declaring the company had split from Microsoft. As part of the split, Monolith had bought the rights to not only Riot, but also DirectEngine – Monolith had basically spent big bucks to get a game and technology that technically, was its to begin with.

Perhaps to help wash away the bitter taste of the deal, Monolith renamed Riot to 'SHOGO: Mobile Armor Division', and DirectEngine became 'LithTech'. Work also began on the sequel to Monolith's Build based Blood.

Was DirectEngine worth the hassle? The technology certainly sounded impressive at the time, incorporating features such as level of detail, mesh deformation, light mapping, colored dynamic lighting, and DirectMusic for 3D sound and dynamic music – technology we take for granted in games today.

Just recently, Monolith was acquired by Warner Bros. Interactive – just months after CEO Jason Hall left to join the division. Monolith is currently working on the Matrix MMORPG (Massively Multiplayer Online Role Playing Game).

Hardcore development on Prey continued throughout 1997-1998, and enough work was done on the title that it made a strong showing at E3 – albeit in the form of a non-interactive demo. This period was arguably the 'golden age' of Prey, when the project was at its most coherent. However, it was towards the end of 1998 that both Schuytema and William Scarboro – the last DIP working on the game – upped and left 3D Realms.

'Why did I leave? Quite simply, I was asked to,' says Schuytema. 'I was in charge of the game, and the game had some very real tech problems – like I was the coach of a football team. Sometimes the coach has to go.

'Again, with the hindsight of running my own company for nearly six years, I can see why they made the calls they did, and I respect them for that,' says Schuytema.

Schuytema has no bad feelings over working at 3D Realms or even what happened with Prey. In fact, he believes the company has a number of admirable qualities that encouraged creativity.

'I loved working at 3DR, though it was a little challenging with a wife and small child. It was an energised place with a great vibe, and everyone there cared passionately about games – I am truly indebted to both George and Scott for all they taught me during my time there,' says Schuytema.

'George has some sort of strange gene in his DNA that allows him to decode and deconstruct gameplay experiences like I've never seen before – and he did a great job decoding gameplay for the team so they could then build back up new and innovative game experiences.'

Sadly, William Scarboro, the other developer to leave Prey with Schuytema, died in August 2002 from an asthma attack. Along with Prey, Scarboro worked on Apogee's Rise of the Triad and Wacky Wheels.

'William was a great guy with talent to burn,' confides Schuytema, who developed a strong working relationship with Scarboro while he was at 3D Realms.

'He had these great quirks, like he was some character out of some crazy Farley Brothers movie. He always wore a black T-shirt (with a pocket) and jeans, listened to the most hardcore rap and hip-hop when doing math-intensive coding, and followed this odd diet that [had] him eating oil-soaked pasta one day and huge steaks the next.

'The programming community lost someone very special with William, that's for sure,' says Schuytema.

Corrinne who?

With Schuytema gone, Prey was in need of a new project lead. Enter the mysterious figure of Corrinne Yu.

'We never met in person,' says Schuytema. 'Though we did correspond via email after she left 3DR as we tried to see if the tech she was developing was a match for some projects we were interested in – she's a very gifted programmer.'

Corrinne got her major break in the gaming industry at Zombie in 1995, where she was responsible for coding the original Special Ops engine. Before that, she worked at a company called Tachyon Studios as a lead programmer.

In 1997, ION Storm hired Corrinne as its Director of Advanced Technologies, where she worked with Tom Hall and John Romero on Anachronox and Daikatana. While there, a few sites caught up with her and managed to conduct interviews, including PlanetQuake (www.planetquake.com) and GameGirlz (www.gamegirlz.com).

ABOVE: Corrinne Yu, the world's hottest game developer.

According to a Tom Hall quote on GameGirlz website: '...she is a genius, producing code in minutes that astounds. At any point, she will be coding, running up the stairs, lecturing on the merits of Source Safe, running down the stairs, eating 10 plates of food, discussing quaternions, or watching anime. She's a fine, quirky Director of Advanced Technology, and a really interesting person to either talk to or be freaked out by.'

Perhaps the most intriguing part of Corrinne's work at ION Storm was her pet project 'Aidoru' – a 3D FPS engine that featured advanced technology far beyond that of competing titles, including Unreal and 'Trinity' – id's codename for what was to become, in some part, Quake 3.

Aidoru was to make use of true dynamic 3D lighting, 24-bit and 32-bit textures and procedural vertex and texture animation. A lot of these features found their way into Quake 2 code base ION Storm was using for Anachronox.

Then, in November 1998 came the news that Corrinne had left ION Storm and had been picked up by 3D Realms to work as lead programmer on the company's next-generation engine. The name Aidoru disappeared, and to this day little is known about Corrinne's reasons for leaving ION Storm. What is most likely is

Hook, line and sinker

In the midst of all this development and innovation, there was 3D acceleration. 3D has grown up alongside the FPS and has been pivotal in providing the genre with a number of revolutions including volumetric shadowing, pixel shaders and high dynamic range lighting.

Up until 1998, there were three graphics APIs (Application Programming Interfaces) – DirectX, OpenGL and Glide. It was in 1998 that the future of Glide was decided.

'DirectX and OpenGL in particular were gaining significant traction, and 3dfx was in pretty significant denial about the long-term viability of Glide,' says Brian Hook, one of the pioneers of 3dfx' graphics API. Hook has worked for a number of companies, including 3dfx, id – where he helped to program Quake 2 and 3 – and his own business, Pyrogon Software.

'Glide was positioned there [at 3dfx] as a "competitive advantage", which was very true in the 1995-1997 time frame, but once 3D APIs began to mature, it really didn't have much of a reason to continue on.'

According to Hook, 'the Glide API wasn't that advanced, and was considerably inferior to OpenGL'. 'Glide was a practical concession. In the short term, to get a decent API [into] the hands of developers. By "decent" it meant that a lot of the higher level stuff had to be deferred to game developers who would have been too constrained by OpenGL's pipeline,' says Hook.

'Compared to Direct3D, I think Glide was significantly better just from a usability standpoint, which is one of the reasons why Glide managed to survive so long.'

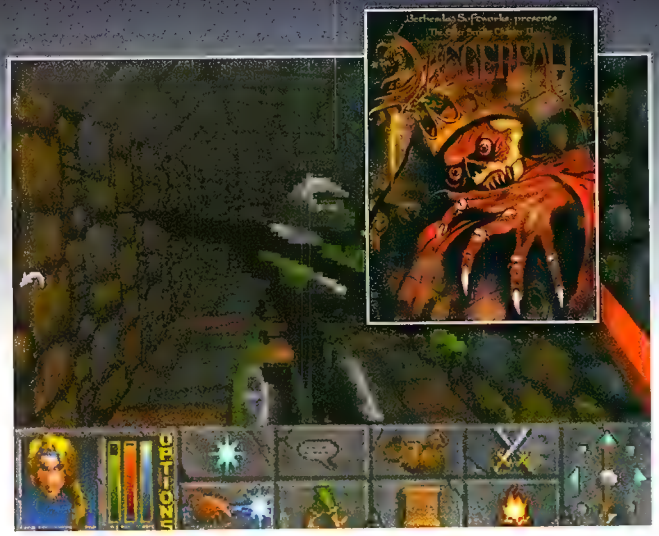
'I thought it did a terrific job for what it actually needed to do during a time when really no one in the PC space comprehended what 3D acceleration was all about. But by 1999 Glide was completely irrelevant.'

In 1998, Hook left 3dfx, in dismay, over the company's direction. 'I left because I had pretty much lost faith that they had any idea what they were doing.'

'A little known fact is that 3dfx was originally created for the coin-op industry... moving their products down into the PC space was going to be gravy, milking the enthusiasts for the privilege of – get this – playing arcade games with full fidelity at home,' reveals Hook.

'That was not new. It played out for many different reasons.'

In 2000, 3dfx declared bankruptcy and was quickly snapped up by NVIDIA. Today, Glide and ancient Voodoo cards are the company's only legacy.



ABOVE: The Xngine-powered Future Shock and Daggerfall are Bethesda's best remembered games. Daggerfall sacrificed stability for depth, but this mattered little to those who loved the game.

that she was frustrated over the craziness that was Daikatana and concerned about the company's future. Indeed, ION Storm Dallas closed its doors in 2001.

Shortly after joining 3D Realms, Corrinne was appointed the position of project lead on Prey, and seemed an appropriate choice considering her experience working on the Quake source, as well as her own knowledge of creating engines from scratch.

Unfortunately, for both Corrinne and 3D Realms, neither Prey nor her career in the games industry were meant to be. Sometime early 2000, 3D Realms stopped pimping Prey on its website, Corrinne left the company and 3D Realms dreams of making their own engine evaporated. The focus was shifted onto Duke Nukem Forever, where it has stayed for the last four years.

No one knows where Corrinne is now – the only traces left of her are some old game site interviews, posts on 3D graphics Yahoo groups and few Slashdot entries. Nothing however is dated beyond 2001.

Daggerfall into the void

Blue Sky and Apogee weren't the only companies innovating 3D back in the 90s. Bethesda Softworks, today known for its award-winning Morrowind series, was busy crafting Xngine, its own gift to the world of FPS.

Developed in two years by Danes Kaare Siesing and Morten Moerup, Xngine featured true 3D and phong lighting, both of which were considerable feats way back in 1995, when Quake was still in development.

The first game to use Xngine was Terminator: Future Shock. Perhaps not often remembered for its contribution to 3D, Future Shock is heralded as the game that brought us the now-ubiquitous mouse-look.

'That was me,' says Todd Howard, producer for Future Shock. More recently, Howard was the project lead on Morrowind, and is the executive producer on Fallout 3.

'Kaare made a similar interface for the editor that we built levels in, and I tweaked the interface so we could use the mouse in-game and everyone here loved it. I will say that the press at the time didn't take to the mouse-look at first – they really wanted a Doom-style keyboard config.'

Another Bethesda title, Daggerfall, was also developed around the time of Future Shock. It too made use of Xngine, and is perhaps the best remembered of Bethesda earlier titles. According to Howard, Daggerfall's main strength, and biggest downfall, was its immense scope. At any given time, the team consisted of around 10 people, working as a collective. This number would be ramped up to about 20 towards the final stages of production.

Howard believes the size of the team was about right. However, he does admit that, thanks to the game's almost insurmountable depth, Daggerfall unfortunately shipped as a less than stable product.

'In hindsight, yes. [It was] very buggy. We simply didn't test it enough on different hardware. It worked great on our machines here, but out in the market, it had "issues".'

'[But] people love open ended games, even if they have bugs. If they didn't have bugs, even more people would love them.'

When it's done

First person shooters have defined gaming as it is today in incalculable ways – from technology to businesses to people, it has had a wide-bearing influence – one that has been as much positive as it has negative.

'The industry today is very much big business,' says Hook. 'Games cost more, are much broader in scope, have to support consoles a lot more, and are managed (or at least should be managed) more like assembly lines.

'Even five years ago I think every person on a team could have a concrete contribution to a project. Today there are far more cogs-in-the-machine, so an artist or a programmer today can only affect a tiny portion of the overall.

'It's the difference between a musician and an orchestra and a rock band. In the rock band you can make a statement – in an orchestra you basically just try not to fuck up and make everyone else sound bad.'

Irrational's Chey agrees. '[The industry] continues to get more professional as the amount of money being made and the cash being spent goes up.

'Unfortunately, this does not correspond to an increase in the amount of innovation in the industry – in fact, probably the opposite,' says Chey.

The opinion that the modern games industry is driven by dollars is universal. Games are made because they will sell, rather than being new or innovative.

'The high cost of development is unfortunate, as it makes risk taking harder and encourages "do what you know" behaviour, and players reinforce that by buying the same way,' says Church.

In the end, it's up to the developer if it wants to try to innovate, or just make money. Usually, the decision is made on the basis of whether it can afford to make a dud.

'Games are made by people, and ultimately a great game comes from getting a group of people together who like each other and want [together] to do something special,' says Chey.

'If you can't make that happen, you can forget your chances of anything really good coming out it all.'

'Machine Minds' by Devoid

The image is basically a futuristic robot looking at a modern day cpu, made and rendered in 3Ds MAX 3.1 and postprocessed in photoshop.

Create the winning *Art*omic and win the latest version of combustion, valued at $1995, from discreet. Email a preview (no larger than 5MB) of your games or hardware-themed masterpiece to:

artomic@atomicmpc.com.au

Reviews

Fee VIVO Fum

Nathan Davis smells the blood of an evil criterion.

I've played around with some VIVO-equipped cards recently and have callously been reminded that some things just weren't made to play nice. You see, the first half of the acronym – *video in* – generally works flawlessly with a growing range of easy to use software, albeit unknown to the casual user. But its sibling – *video out* – is no slice of cake even though it has commonly been around for much longer.

Sound is easily transmitted – all you really need is an extension line, or if you don't already have the correct output, an adaptor – and you're set. Simplicity in all its quintessence. Video, however, is nowhere near as straightforward. There's no readily available, easily usable D-sub to composite connector, because unlike sound, video standards aren't the same across the board. There exist different display formats, refresh rates, and resolutions not to mention the wider range of physical connections. As a result, you can't just rip out your monitor, jack in a TV and Bob's your pet monkey, as it requires some tweaking with the monitor plugged in to get it jump started.

Once you've managed to correctly set up video out and you have it displaying the desktop, the greatest challenge yet is getting movies sent over the wires.

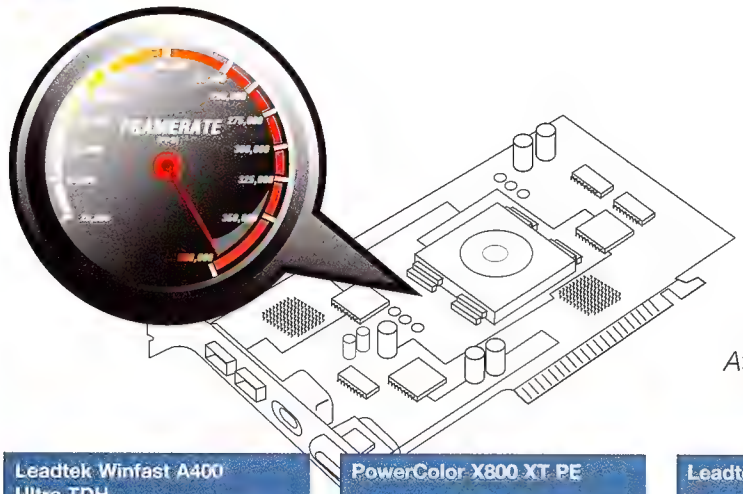
The problem stems all the way back to Microsoft's Direct Show. It has major issues with displaying video overlay to more than just a monitor – two monitors aren't generally the problem, it's when a TV is introduced on video out that the situation grows pear-shaped. Moving the video window from one monitor to another works flawlessly, but when the second monitor becomes a TV, it is enough to lose the video feed altogether. The overlay box that the video is supposed to be printed to remains, but the video becomes kaput.

Video overlay is a nasty bastard to play with. The problem involves the fact that the TV is currently treated as merely another monitor and this isn't necessarily good when you wish to also have a monitor plugged in at the same time. The telly isn't always going to be right next to the machine, as you could simply be wanting your PC to every once in a while display some video in the lounge. Currently, you need to see the TV to successfully use it.

The dilemma also largely sits with the video drivers. The drivers don't always detect the display devices correctly so there should be a more customisable and advanced options. ATI haven't done too badly in this sector, as you can select exactly what preferences you wish to use for your TV and the detection procedure isn't too shabby – but it's still treated as simply another monitor in the Display panel. NVIDIA's alternative isn't as peachy – as soon as you plug in a TV, it often automatically detects the displays the wrong way around; the TV becomes the high-res, primary display and the monitor becomes the low-res, desktop-extended, secondary device. It is apparent this is because Microsoft's resolution 'Settings' tab is, incredibly, in conflict with NVIDIA's resolution selection method.

Considering people don't always have their TVs right next to their monitors, it would be great to see a TV simulator window implemented into the drivers. This is a little window on your true primary display device that shows everything that is being output over video out. I would also like to see a standard developed on all drivers, so that at the very least, a basic VGA output is always being supplied over a D-sub/DVI port – even when the only device plugged in is a TV. This way, at least a monitor can be used to see what the fudge is going on. Lastly, the TV should be treated as such, thus, a completely separate tab in the Display settings would be a dream.

Microsoft, NVIDIA and ATI – I'd love to see the experience of VIVO a little less bone grinding.



Framerate

Atomic Labs presents the frame grilled showdown.

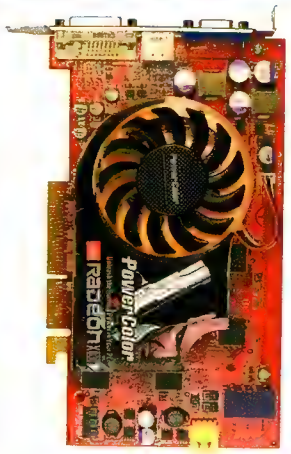
Leadtek Winfast A400 Ultra TDH

☐Specifications: NVIDIA GeForce 6800 Ultra; 256MB 256-bit GDDR3 RAM; 400MHz dual RAMDACs.
☐Core speed: 400MHz
☐Memory speed: 1100MHz
☐Price: $1095
☐Supplier: Rectron
www.rectron.com.au

Not totally unlike the Winfast GT card we reviewed several issues back, this princely arm weight is a monstrous drool initiator. Equipped with 16 pixel pipelines, Shader Model 3.0 and the ability to pump out 35.2GB/s down the pipes of its BGA 256MB of memory, it's instantly apparent this is no douchebag. With a price that is nigh on matching the memory MHz for dollar, this is one of the most sumptuous cards on the market. Über alles, almost.

Leadtek
www.leadtek.com.tw

PowerColor X800 XT PE

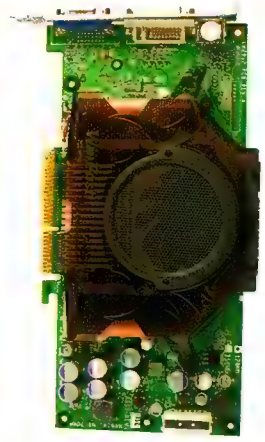


☐Specifications: ATI RADEON X800 XT Platinum Ed; 256MB 256-bit GDDR3 RAM; 400MHz dual RAMDACs.
☐Core speed: 520MHz
☐Memory speed: 1100MHz
☐Price: $935
☐Supplier: Australia IT
www.australiait.com.au

This is ATI's killer weapon; the supreme monarch of all your arses – well, that was the strategy at least. There is major competition in the market again, with NVIDIA whipping out their trump 6800 card. Nonetheless, this red beast won't just idly stand there and doodle its fingers, wielding 16 pixel pipes and 1.6ns (built to handle 1.25GHz) memory modules. Including VIVO support, this baby is everything you could possibly be looking for from a Zen-like video card.

PowerColor
www.powercolor.com.tw

Leadtek Winfast A400 TDH



☐Specifications: NVIDIA GeForce 6800; 256MB 256-bit GDDR3 RAM; 400MHz dual RAMDACs.
☐Core speed: 325MHz
☐Memory speed: 700MHz
☐Price: $598
☐Supplier: Rectron
www.rectron.com.au

Containing about half the copper content found on that of its much larger brothers – the GT and Ultra – it remains relatively heavy but a little bit chilly. However, with such a beastly heatsink in place, we would have liked to have heard a slightly quieter fan rather than the one that is incorporated. While it is loaded with no fewer than 12 pixel pipelines, it's not The Stinging Bee, but running Doom 3 in high detail at 1600x1200 isn't a problem on this, a single-slot package of cyber delight.

Leadtek
www.leadtek.com.tw

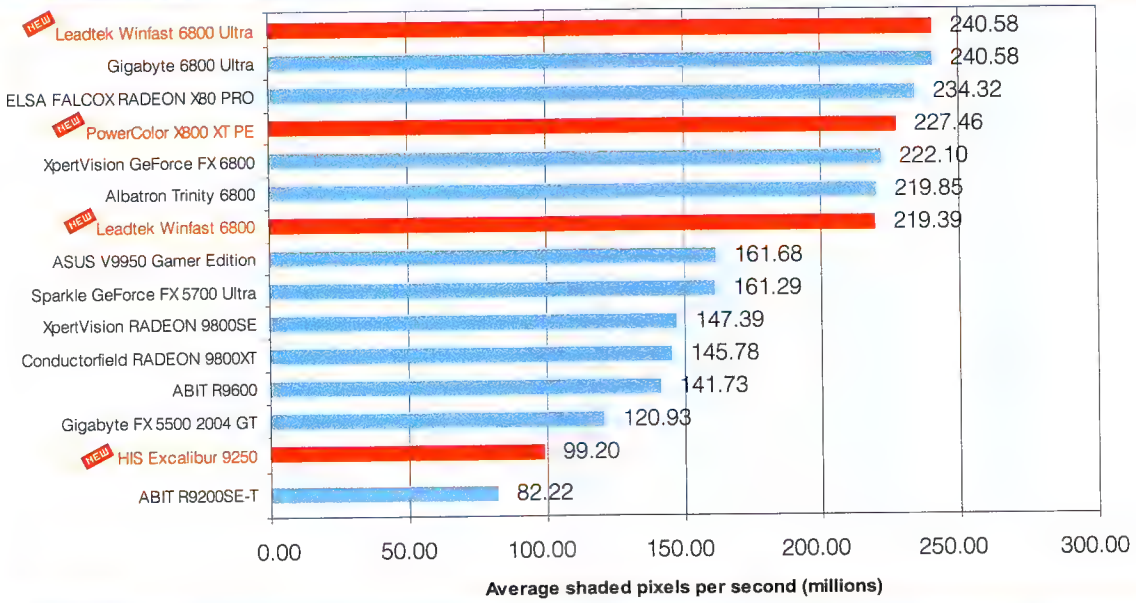
HIS Excalibur 9250

☐Specifications: ATI RADEON 9250; 128MB 128-bit GDDR3 RAM; 400MHz dual RAMDACs.
☐Core speed: 240MHz
☐Memory speed: 400MHz
☐Price: $149
☐Supplier: Akatech
www.akatech.com.au

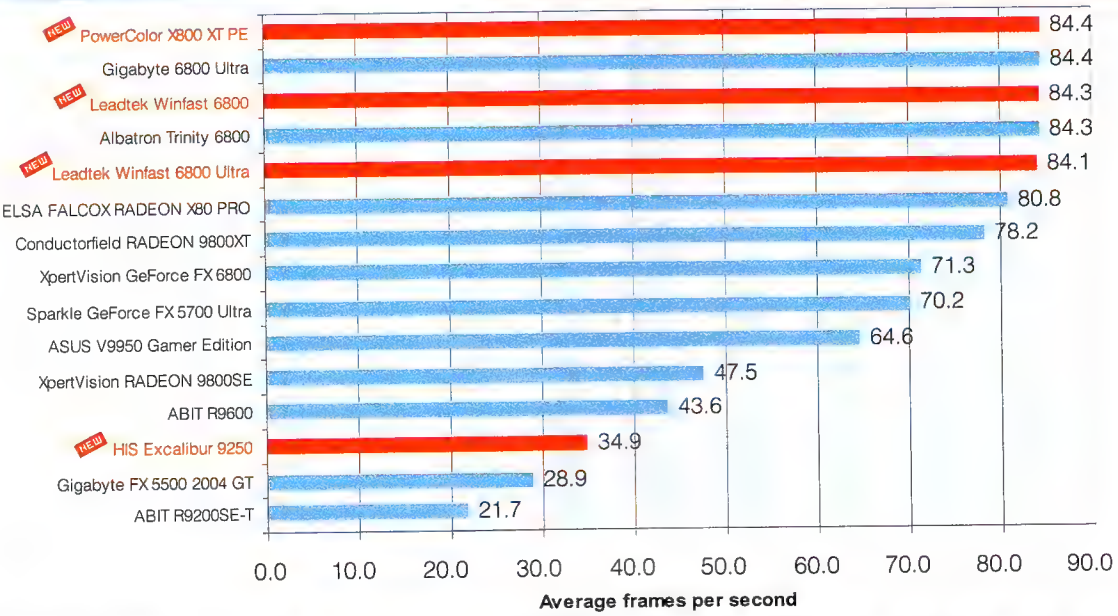
Bar listening to excited ions bouncing around the card, this thing is pure silence, relying on passive cooling. Packing 4ns of TSOP memory, this card can happily bump the memory to 500MHz. However, it still wouldn't be close to creating an orgasmic gameplay experience, unless you're someone who derives pleasure from dramatic death-cam slideshows. No DirectX 9.0 support, but packed with VIVO, this silent card would *be* sex to a Home Theatre PC.

HIS Digital
www.hisdigital.com

Call of Duty



AquaMark3



Video cards

With the high end battle that has raged for months between the GeForce 6800 and RADEON X800 both the big players have now turned attention to the new generation of midrange cards.

Both players have announced offerings based upon the architecture of the current generation of high end products. NVIDIA is now shipping its GeForce 6600 and 6600GT cards, which are PCI-Express native eight pipeline cards that use a cut down 128-bit memory bus (the GeForce 6600GT is previewed in this issue – turn to *page 56* to see more).

ATI has responded by announcing its X700 series of product. There are three variants, the X700, X700 PRO and X700 XT, which are all eight pixel pipeline variants.

XGI has also announced its own cards. We doubt they will ever actually see one, but its nice to know they are still giving it a go.

CPUs

While the release of new products has almost stopped in the CPU market there has been a huge amount of posturing going on as both AMD and Intel ready themselves for the great 2005 festival of the dual core.

During the annual Fall IDF CPU love-in Intel demonstrated its first dual core Pentium 4 chip (there are some concerns over just how representative the demonstration was) and promised dual core mobile (codenamed Yonah), desktop (codenamed Smithfield) and server CPUs would appear in 2005.

This IDF demo actually came a few weeks after AMD took the lid off its 90nm SOI dual core Opteron chip, which is also due late next year. The desktop variant of this dual AMD64 core is codenamed Toledo and is scheduled to appear after the initial server variants hit the market.

Sapphire RADEON X800 PRO Toxic Edition

John Gillooly discovers that it's not just Britney Spears who is toxic.

Supplier:
Achieva
www.achieva.com.au

Website:
Sapphire
www.sapphiretech.com

Phone:
Achieva
(02) 9742 3288

Price:
$TBA

Specifications:

RADEON X800 PRO; 256MB GDDR3; automated RAM overclocking; VIVO; temperature monitoring support; cooler needs two expansion slots.

In a world where there is almost no differentiation between manufacturers' video cards there are some kooky tangents taken when people try to stand out from the pack. We have seen outstanding examples of these over the years, with products like ABIT's OTES GeForce4 Ti4200, which used an externally vented cooler to run well over stock speed, or Sapphire's Ultimate cards that used passive cooling for completely silent running.

But when you strap a giant orange cooler onto one side and a passive heatsink that looks more like scaffolding than anything else onto the other, you are pretty much locked into calling your close to flourescent product 'Toxic'.

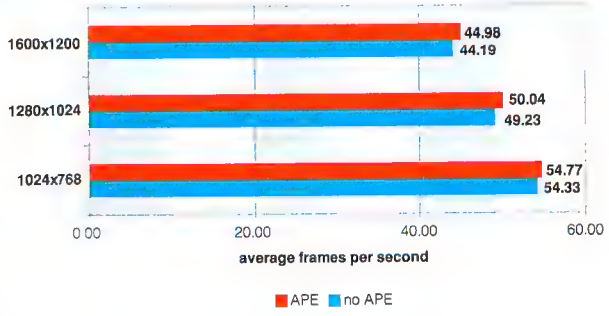
This is exactly what Sapphire has done with its tweaked up RADEON X800 PRO card.

Based around the X800 Pro reference design, this card couples the large heatsink with a special software application that is called Automatic Performance Enhancement (APE) in order to run at higher clock speeds than standard, and do so without the need for the usual trial and error involved with overclocking. In order to get this up and running all you need to do is first install the card and latest CATALYST drivers and then install Sapphire's APE application. There is no interface for the software, it cranks the clocks up on install and off you go. To disable APE just uninstall it.

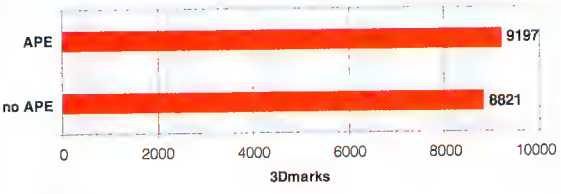
This ease of use is amazingly refreshing, but what does it actually do? Normally the X800 PRO's core clock is 475MHz and its memory clock is 450MHz (900MHz effective). With APE enabled the core stays the same but memory jumps to 520MHz (1.04GHz effective). This is a great leap in speeds, but modern graphics accelerators are finely balanced machines, and just cranking up memory clocks does not necessarily mean anything, especially without a concurrent raise in core clock. So, in order to test the effectiveness of APE we ran it up on our Athlon 64 3200+ testbench, comparing scores with and without the application installed.

While the Toxic card did manage to deliver higher scores with APE enabled in all the tests, the results teetered on the wrong side of insignificance. In the tests that delivered framerate results, the largest difference seen was only 3fps, while in 3DMark03 the gap was a touch over 300 3DMarks, which is a moral victory at best.

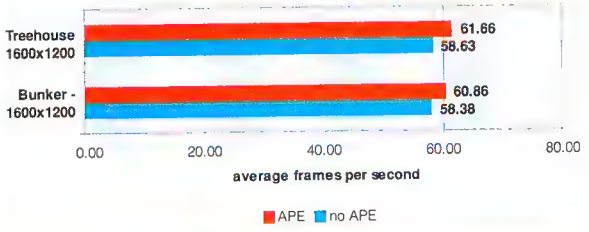
Aquamark3



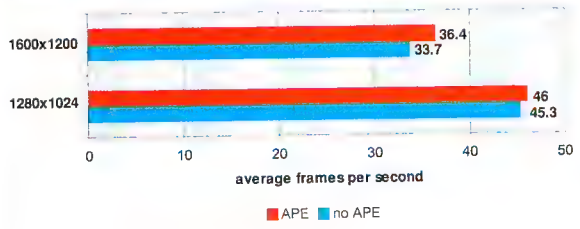
3DMark03



Far Cry – Very High Detail



Doom 3 – 1600 x 1200 High Quality



The X800 PRO is a damn respectable 12 pipeline graphics card, and worthy in its own right, so just because the automatic overclocking doesn't deliver a mindblowing boost it doesn't make it a poor performer overall. In the end it comes down to a simple question of sacrifice. For those three extra frames you effectively lose two PCI slots, and the colour scheme is somewhat garish. You do get a card with good cooling and overclocking potential, and a decent games bundle of Splinter Cell: Pandora Tomorrow and Prince of Persia: The Sands of Time, but it's all down to a matter of personal choice as to whether this is preferred over other models of X800 PRO. JG

SCORE 8.5/10

Superman: Shadow of Apokolips

Sony SDM-P234

Supplier:
Sony
www.sony.com.au

Website:
Sony
www.sony.com.au

Phone:
Sony
1300 720 071

Price:
$4699

Specifications:
23in LCD; 1920 x 1200; 16:9 aspect ratio; 0.258 dot pitch; eight dead pixel replacement policy; 16ms response time; 250cd/m2 brightness; 176° viewing angle; one DVI and two D-sub inputs; 500:1 contrast ratio.

Reduced to a slobbering pile of drool, yet? This thing of beauty is freaking delicious. This widescreen edition LCD display marks the first time Sony has planted its metaphorically prodigious foot in this part of the market. The focus is on enthusiasts who use high quality graphics, require a decent response time and can make use of the extra screen-estate.

On the backlit touch-sensitive menu, there's an option to select which of the three inputs you wish to use. By default this is set to auto-detect but it didn't give a flying toad that DVI was the only cable plugged in. There's a manual option, but you can't access the menu if there's no monitor signal. This is primarily a video driver issue, but migrating to DVI from D-sub almost requires a rip in space-time.

With a sweet native resolution of 1920 x 1200, testing was a thing of dreams. Using the powerful DisplayMate benchmark we were pressed to find much to criticise, as everything has been well engineered. Regardless of intensity setting, the backlight is perfectly even and it has some of the blackest and whitest shades we've seen. However, intensities are a little rippled between levels, with slightly darker levels creating partitions in the intensity gradients.

Most impressive was the phase-lock performance. This showed the screen to be equipped with the best pixel tracking we've ever seen, with no fuzziness regardless of the colour.

hotaward

It does suffer from the 'mighty smudge factor'. Blur is more noticeable on the larger panels in comparison to a smaller display with the same timing – this didn't have any detrimental effects on our gaming-fest, but blurring is evident. Other tests showed up a perfect gamma factor rating of 2.2 and – thanks to the wonders of DVI – a near perfect video bandwidth index measuring ~99.2 - 100 being the holy grail.

With this baby, you pay for what you get and then some. Outstanding performance. ND

SCORE **9/10**

Albatron Widio Deluxe

Supplier:
AMI Computers
www.ami-computers.com

Website:
Widio
www.widio.com

Phone:
AMI Computer Services
(07) 3808-9255

Price:
$249

Specifications:
2.4GHz wireless audio transmitter and receiver; Stereo RCA inputs on transmitter; mini-din headphone output on receiver; seven channels supported; rechargeable battery; Deluxe version includes Audio-Technica Earphone ATH-EM7 SC

Something we at *Atomic* have often wondered is why wireless headphones aren't more common. Out of the handful of models on the market most still use infra-red, which means listening is restricted to positions in line of sight from the base station. It's insane, but thankfully Albatron of all companies has now come out with a product that redefines wireless audio listening.

Based around 802.11 networking, Widio is a transmitter/receiver pairing. The transmitter takes normal stereo RCA connections, converts the analog signal to digital and fires it out over the airwaves to the receiver, which converts it back to analog for listening via headphones (or indeed speakers) connected to its headphone jack.

Simple, config free and completely platform agnostic. All terms that can rarely be applied to IT products, and Albatron has certainly nailed it.

There are so many cool aspects to this product, from the simple fact that it uses a standard rechargeable (via a dock on the transmitter) Nokia 8xx series mobile phone battery to the ability to set up multiple transmitters, all with different inputs and different broadcast channels.

It is also truly plug and play, run the audio inputs from your PC, console, stereo, DVD player or any other sound producing device into the transmitter, plug some headphones into the receiver, turn it on and you are listening to the audio source. Sound is crystal clear and because the data is sent digitally the signal doesn't get choppy when it's out of range, it just drops out. In our tests it worked flawlessly to a distance of about 15m.

hotaward

Widio simply sounds awesome. With the flexibility to use your own headphones and the range and benefits of 802.11 wireless there is no better solution to unwire your audio. If this is what they mean by convergence bring it on. JG

SCORE **9.5/10**

GRAPHICS BY ATI CERTIFIED

PCI EXPRESS

X800XTX-VIVO

DEON X800XT PCIe VPU

I-Express x 16 and 256-bit
emory Bus
6MB GDDR3 Memory
-pipeline Architecture
ndering Power
upport HDTV

GC- RX600PRO-C3/D3

RADEON X600PRO PCIe VPU

- PCI-Express x 16 and 128 -bit Memory Bus
- 128MB /256MB DDR Memory
- Support SMARTSHADER 2.0, SMOOTHVISION 2.1, HYPER Z III and VIDEOSHADER

GC- RX300-C3/D3

RADEON X300 PCIe VPU

- PCI-Express x 16 and 128 -bit Memory Bus
- 128MB/256MB DDR Memory
- Support SMARTSHADER 2.0, SMOOTHVISION 2.1, HYPER Z III and VIDEOSHADER

GECUBE

www.gecube.com

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Melbourne Office: 03 9551 8298
E-mail: sales@kingmax.com.au

NVIDIA GeForce 6600 GT

Meet the card that broke John Gillooly's brain.

Supplier:
NVIDIA
www.nvidia.com

Website:
NVIDIA
www.nvidia.com

Phone:
N/A

Price:
$TBA

Specifications:
GeForce 6600GT GPU; 500MHz core; 128MB 500MHz effective 128-bit GDDR3 memory; SLI support; x16 PCI-Express Native connection; 8 pixel pipelines; Shader Model 3.0 support.

Over the past six months NVIDIA has dragged itself out of the GeForce FX performance quagmire with some stellar high end cards in the form of the GeForce 6800 series. When we talked with its chief scientist, Dr. David Kirk a few months ago he hinted that NVIDIA had a GeForce 6 series mainstream core in the works that would blow people away. Enter the GeForce 6600 core, formerly codenamed NV43. This PCI-Express native mainstream GPU is NVIDIA's true comeback kid; bearing all the same shading features as the 6800 series, but with only 8 Shader Model 3.0 pipelines and a 128-bit memory bus rather than the 256-bit one seen on the 6800.

There are two models of GeForce 6600, and by far the tastier one is the GeForce 6600 GT. With a suggested price tag of US$199 it has a core speed of 500MHz, 128MB of GDDR3 memory running at an effective speed of 500MHz. Thanks to PCI-Express, support for SLI mode it's specifications hint that it could be the most impressive pieces of mainstream hardware to touch us since the mighty GeForce4 Ti4200 smashed through the price/performance barrier.

But on paper and in-system are two very different propositions. Often we see great looking specs being hobbled in practice, so we paired the GeForce 6600 GT with an i925X based motherboard and 3.4GHz EE Pentium 4 CPU to see how it fared.

We ran Far Cry at Very High detail in 1280x1024, then 3DMark03's standard test and finished with Doom 3 at high detail. Then we reran the tests because we literally couldn't believe what we were seeing, then we ran them a third time for good measure.

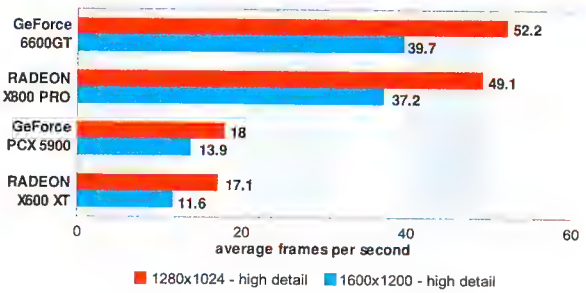
The reason is clear from the graphs. The current mainstream product from ATI is the RADEON X600XT, and NVIDIA did have its GeForce PCX 5900 in the mainstream. But these two cards are not even in the same league as the GeForce 6600 GT. In fact, it performs nearly four times faster than the PCX 5900, and well over double the performance of the X600 XT in Far Cry.

NVIDIA announced the GeForce 6600GT at Quakecon this year, touting it as 'the video card for Doom 3'. NVIDIA has both superior OpenGL performance and Doom 3 specific features like Ultrashadow 3 in its hardware so good performance is not surprising. But the last thing we expected was for it to beat ATI's 12 pipeline RADEON X800 PRO in Doom 3. But it did, albeit by a small amount.

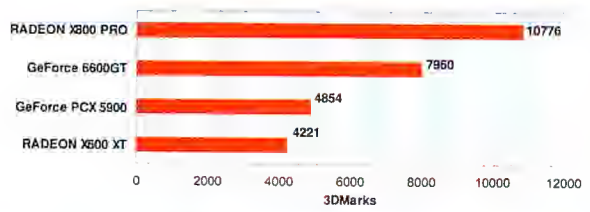
ATI is readying the X700 in reply but it is going to need to be pretty damn outstanding to beat the GeForce 6600 GT. This card is quite simply the best thing NVIDIA has produced since the GeForce4 Ti4200 and may well end up being the finest price/performance straddling card. As soon as NVIDIA gets its SLI supporting PCI-Express chipsets into market it will be easy to strap a by then cheaper card in beside it and crank performance up even further. Goddamn. JG

SCORE

Doom 3 – Demo 1 – High Quality

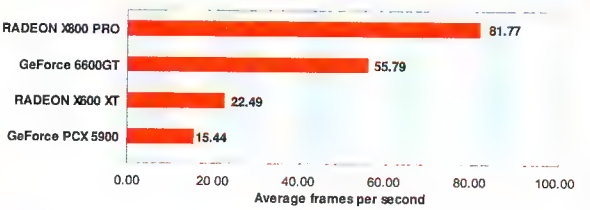


3DMark03



Far Cry – Bunker – 1280 x 1024

Far Cry – Treehouse – 1280 x 1024



Creative Zen Portable Media Centre

Supplier:
Creative
www.au.creative.com

Website:
Creative
www.au.creative.com

Phone:
Creative
(02) 9021 9800

Price:
$999

Specifications:
Windows XP Portable Media Centre; 3.8in LCD screen; 20GB HDD; TV and audio out; USB 2.0 connection to PC; carrying case; battery charger.

Even before Microsoft officially launches what appears to be a slightly hobbled version of Windows XP Media Centre Edition (MCE) the Mobile equivalent has launched in the form of Creative's Zen Portable Media Centre (PMC). In keeping with the OEM only tradition of Media Centre, this is a self-contained device that's been built around a 20GB HDD and a 3.8in LCD Screen.

It's designed as a portable video player, and to work best when combined with a media center PC. It uses a similar interface to MCE and is designed to be navigated with a minimum of control and maximum ease; a simple console-styled joypad in this case.

In order to get media onto the device you need Windows Media Player 10. When you drag over an 'unsupported' format like DivX or XviD Media Player 10 converts the file to Windows Media Video in a format suitable for display on the small screen. This takes some time to do, but the end result is video that looks mighty nice. This is one fiddly part of the DRM built into the PMC devices, but it caused only minor inconvenience.

It also supports television recorded by MCE systems as well as images and audio. There is support for TV out, but the unfortunate side effect of formatting video for the small screen is that it generally looks quite crappy when shown on a larger display. TV out is perfectly adequate for doing slideshows though, and it could have been further enhanced with the inclusion of visualisations to go with the audio.

With decent battery life (Creative quote seven hours for video) and without the restrictions on content that seem to be unfortunately destined to plague Sony's PlayStation portable (which is probably PMCs greatest potential competitor unless Apple gets off its butt and releases a video iPod) this is a handy unit. It is costly and somewhat bulky but in terms of sheer cool factor few things come close, and the thought of using it while travelling is almost enough to cut through the cost factor. JG

SCORE **8/10**

Logitech MX-1000 Laser Cordless

Supplier:
Logitech
www.logitech.com

Website:
Logitech
www.logitech.com

Phone:
Logitech
(02) 9972 3711

Price:
$159.95

Specifications
Eight button Logitech 'Fast RF' mouse; 800dpi; four-way scroll; base station; laser illumination; USB to PS2 adaptor; 5.8 megapixels.

The humble mouse has come a long way since Douglas Engelbart's first wooden 'X-Y position indicator'. No greater, recent feat has come about since LED-based optical blasted our jocks clean off. It just gets better.

Rather than a typical LED lighting the surface, this mouse is the first to instead use laser illumination, so no trippy glow, but this provides immensely more accurate surface tracking as laser offers a higher contrast image. The MX-1000 tracks 5.8 megapixels per second at 800dpi and in comparison, the now much slower MX-700 uses 4.7 megapixels per second at 800dpi.

We tried every surface we could think of and it had no problems, except, naturally, on mirrors or glass. In terms of performance, wireless couldn't get any closer to that of cabled – even in Windows, we noticed such a performance increase over the MX-700, that it took some time to get used to the amplified precision.

Aesthetically, the new shape hugs the hand better. It also has a 'thumb pouch' on the side, which can take a bit of getting used to if you usually use the thumb to grip the surface for better traction.

There's now also an on/off button underneath, as the battery is now a built-in Lithium-ion. Unfortunately there is no exact math as to how long it will last and only Logitech can replace it. Thankfully the base station has been improved, with the mouse now making an easier connection with the two charging contacts.

hotaward

With exceedingly high performance and great design, we couldn't recommend it more, even for anal-retentive fans of wired-mouses. Laser is obscenely good. The MX-1000 has well and truly proven this and smashed itself onto the market as a fine example of this new technology – *and* its RF. With deadly accuracy, this is the greatest mouse we've ever had the pleasure to lay our hands on. Kudos to Logitech for another shining achievement. ND

SCORE **9.5/10**

Arctic Cooling VGA Silencer

Supplier:
PC Case Gear
www.pccasegear.com.au

Website:
Arctic Cooling
www.arctic-cooling.com

Phone:
PC Case Gear
(03) 9584 7266

Price:
$37.50

Specifications:

External intake, two slot cooler; obstructs two PCI slots; fits RADEON X800 series graphics cards (other models available for other cards).

When used to describe computing silence becomes quite an objective term. Arctic Cooling's VGA Silencer does not silence anything, but it does provide a unique cooling solution for graphics cards. The card does require a compromise though; a sacrifice of two PCI slots worth of expansion in order to fit the seemingly monstrous cooler.

It is a popular enough model that both Sapphire and HIS are using them as standard on particular models of RADEON X800 series cards. In addition, there is a model available at the same price for GeForce 6800 series cards. As such, it does offer certain advantages.

Previous experience with large VGA coolers like those made by Zalman has made us wary of fiddliness in the *Atomic* labs, but the VGA Silencer surprised us with how easy it was to attach, the actual mounting can nearly all be done by hand, with a screwdriver needed purely for tension. It also doesn't weigh as much as the Zalman coolers do, even if its aesthetics aren't as great (they are light years above the flouro orange model used on Sapphire's TOXIC card though).

One interesting aspect is that unlike the screaming FX Flow coolers of NVIDIA days, or even ABIT's infinitely more elegant OTES cards, the cooler sucks air into the case rather than vent it. This means that cooler air is flowing over the heatsink; however, it also means that it is introducing more warmed air into your system, so be sure you have good exhaust. It is also against conventional wisdom to have a rear intake, so if your case is on the warm side keep an eye on temps.

It does allow clocks to be pushed higher than the normal cooler but not significantly, and also while it is whisper quiet, the stock ATI cooler doesn't do too bad a job of keeping noise levels down, although the benefits will be more obvious if you are using the GeForce 6800 variant. If you really want to keep the noise level of your PC down however, it is a very cheap option. JG

SCORE **8/10**

LIS 2 Premium Indicator

Supplier:
PC Case Gear
www.pccasegear.com.au

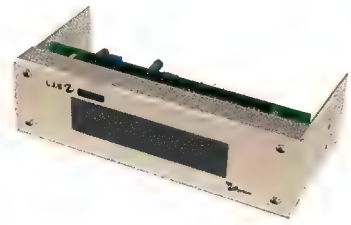
Website:
Virtual Lab System
www.vlsys.co.kr

Phone:
PC Case Gear
(03) 9584 7266

Price:
$149

Specifications:

5¼in USB vacuum fluorescent display unit; 20 x 2 array of 5 x 8 character squares; auto speed controlled quad-fan rheobus; fully software-controlled display.



There isn't a whole lot more that looks sexier on a case than a display unit. They generally net in droves of people – like this lustrous Lost In Space VFD. This is the second generation of the popular display unit and it looks mighty schmick.

Unless you're already an LIS software guru, reading the manual and help files are highly recommended acts of sanity, as there are *wads* of preferences. The LIS program version we used for testing was v2.0.1.4 and there is no doubt that it's a distinctly powerful software package. However, it does seem to be overly complicated.

The main menu is simple enough – just select what you want displayed on the unit, whether that be the realtime CPU clock, 'Yes master', Motherboard Monitor statistics or practically anything. The messy area, however, is in the preferences for each section, having to configure what system variables and text should be shown – this isn't exactly straight forward.

Logos have been pre-made for well-known manufacturers, but you can even make your own symbols with the 'CG Builder' program and have them displayed. Unfortunately this also isn't exactly designed for the light-hearted.

The visualisation plug-in for Winamp is far more fluid than the Windows Media Player one, with the WMP plug-in often pausing. Additionally, it wouldn't update the VFD if the visualisation wasn't displayed on-screen, whether that's because you have the player minimised or you have the window moved off-screen. Not so for Winamp.

Overall, the unit itself is beautiful. Albeit, perhaps a little much for some, but it will at least let you know if they have new emails. So yes, the hardware is practically perfect, however if it's to be targeted at *any* audience, the software requires much work done on it, particularly in regards to making the interface more understandable. If you don't mind spending a bit on a VFD unit that requires some man-handling, this is your premium beef. ND

SCORE **7/10**

NEC ND-3500A

Supplier:
i-Resources Group
www.i-rgroup.com

Website:
NEC
www.nec.com

Phone:
(02) 9725 7688

Price:
$159

Specifications:
4x CLV DVD+R9; 16x CAV DVD-R/+R; 4x CLV -RW/+RW; 16x CAV DVD-ROM; 48x/24x/48x CAV CD-RW; 2MB cache.

Another month whizzes by and more doublings in speed hit the fan. NEC's new beast is pimped as burning both plus and minus discs up to 16x and dual layer media at 4x. With the ability to also burn CD-R media at 48x, this makes the NEC ND-3500A one of the fastest-featured drives around.

It's equipped with laser modulation that boosts the accuracy of written data and 'Active Optimised Power Control' which monitors and reacts to the writing power and reflection of the media so as to achieve the perfect write. While supporting a big mass of write features, it doesn't support Mount Rainier.

Bar the official firmware releases, we usually won't play around with the 'grey-area' flash updates in reviews, as this creates an unfair rift between the way the product was made to perform and how it does with unofficial modifying. As such, the firmware it was packed with, version 2.16 was the latest officially available and what was tested with.

The media we used for testing the DL capabilities was a Verbatim DVD+R DL verified disc rated at 2.4x. Nero CD-DVD Speed recognised that this drive could burn it at either 2.4x or 4x – and this was certainly the case. In testing, it filled a 7.96GB disc in 26.8 minutes, hovering just over, at 4.16x without a drop, bar a quick dip when changing layers. With this drive, dual layer media is much more bearable to burn.

By the time you read this, the unit's shelf price is bound to be different to the retail price we were given, but this will largely depend on where the market goes. In terms of kick-arse warranty voiding, there's a hacked firmware making the rounds that enables the Bitsetting of single layer discs – making DVD+R media appear as DVD-ROM discs.

hotaward

Overall, this multi-format drive is amazingly good. It sports the fastest available CD writing speed on DVD burners, the fastest available + and - write speed and the ability to complete a dual layer DVD+R in half the original time. If you're in the market for *any* optical burner, consider this incredible high-speed beast. ND

SCORE 9.5/10

Seagate Barracuda 7200.7 NCQ

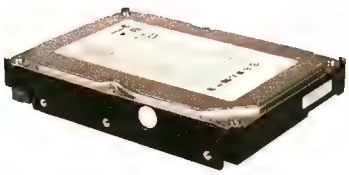
Supplier:
Ingram Micro
www.ingrammicro.com.au

Website:
Seagate
www.seagate.com

Phone:
1300 653 333

Price:
TBA

Specifications:
160GB capacity, 7200RPM, SATA-150 interface, NCQ-enabled.



Aesthetically Seagate's latest Barracuda 7200.7 ST3160827AS 160GB drive doesn't look all that different from its predecessor, the 160GB Barracuda ST3160023AS. Model numbers aside, the new drive is identical to the original with one significant difference – the inclusion of the much touted NCQ in its firmware, otherwise known as *Native Command Queuing*.

NCQ is somewhat of a revolution for SATA, and in fact it forms part of the SATA II specification. Manufacturers, however, wanting to gain an edge in performance are implementing NCQ into SATA-150 drives now as a stop gap solution.

NCQ has its roots in a powerful feature of the SCSI specification known as TCQ (*Tagged Command Queuing*). TCQ enables SCSI drives to streamline delivery of data by tagging and re-ordering incoming commands, optimising movement of the drive heads to reduce latencies and minimise overhead. Under certain loads, such as multiple simultaneous random accesses, this can greatly improve performance.

NCQ is bascially a tailored version of TCQ for SATA, and Seagate has one of the first NCQ drives to market in the ST3160827AS. It needs, however, an NCQ aware controller – the more recent SATA adaptors from Promise or Silicon image support it, as do newer Intel chipsets.

But does it make a difference? Seagate is quick to note that, by its nature, NCQ will show greater performance in some tasks over others. So we put the NCQ-enabled ST3160827AS and non-NCQ ST3160023AS side by side and benchmarked them for desktop use.

And, indeed, the ST3160827AS is faster, but only marginally. PCMark04 showed a six percent speedup for the XP Startup test and a 15 percent increase in the File Copy test, and for raw speed Diskspeed32 revealed a slightly higher ceiling of 61MB/s on the NCQ drive over 55MB/s on the non-NCQ.

Even if the advantage appears small, it's free performance if you have an NCQ capable controller. Ultimately it'll become the standard when SATA II arrives. AM

SCORE


ATI
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ATI RADEON X800
TECHNOLOGY
Integrated
PLATFORM
ATI RADEON 9100 PRO IGP
TECHNOLOGY
Mobile
GRAPHICS
ATI MOBILITY RADEON X600
TECHNOLOGY
ati.com

ASUS RADEON 9250 Gamer's Edition TD

Supplier:
ASUS
www.asus.com.au

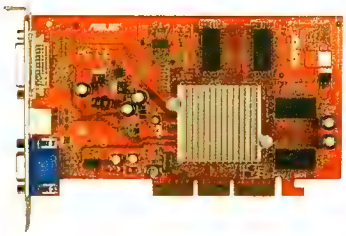
Website:
ASUS
www.asus.com.au

Phone:
ASUS
1300 799 833

Price:
$149

Specifications:

ATI RADEON 9250; 256MB 128-bit 5ns TSOP GDDR RAM; four pixel pipelines; passive heatsink; DVI, D-sub and composite out.



With the home theatre market slowly taking hold, there is the rising need for silent but well-performing cards. These same cards generally fall under the category of the 'office' or 'parent's machine' but they are growing more powerful and equipped with VIVO – or as is the case here, at least video out. These cards have a target audience, particularly in the HTPC arena. Even so, ATI are also pushing the 9250 chip for gaming.

Based on the 9200 series, the 9250 has programmable hardware DirectX 8.1 pixel/vertex shaders – no DirectX 9.0 – sports a lowly four pixel pipelines and a core of 240MHz. With a minimalist design in mind, the only notable features of this particular card are D-sub, DVI and composite out with a passive heatsink.

With eight modules worth of 256MB 5ns TSOP memory, although TSOP memory is slowly phasing out, their speed fits perfectly on low-end cards such as this and keeps the price stumpy.

The gameplay ability of this card is *useable* at best. Spitting out 35.1 frames in our Call of Duty time demo, it sits just above the performance vicinity of a GeForce FX5600. With Doom 3, it's inherently obvious that the card benefits from the large memory without a huge hit on processing performance. It's unplayable at 1024 x 768, even in low detail – with the GPU in overtime for higher resolutions – but the differences in performance between a playable high quality 800 x 600 (averaging 21fps) and low quality (25fps) were surprisingly meagre. Not too shabby for a low-end budget card, but we wouldn't recommend this card for a gaming platform.

It sports a 128-bit memory bus – however there are also 64-bit and 128MB variants of this chip. Unless it *is* amazingly to be used for performance gaming, 256MB is seemingly overkill for a budget card.

What really concerned us was that the stock 240MHz core heats up to a worrying point of digit-burning. Considering the passive cooling, this card certainly wasn't built for overclocking and the 5ns modules are already running at full speed (400MHz).

If you're planning on using a home theatre box as a recording station, you'll want to choose a VIVO variant, but otherwise the 9250 is simply a faster alternative to current onboard video. ND

SCORE **7/10**

Gigabyte 8TRS350MT

Supplier:
Synnex
www.synnex.com.au

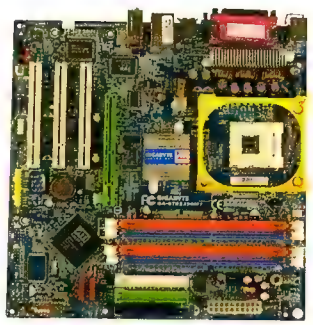
Website:
Gigabyte
www.gigabyte.com.tw

Phone:
Synnex
1300 880 038

Price:
$159

Specifications:

Socket 478; 4 x DIMM dual channel DDR; ATI RADEON 9100 Pro IGP; two SATA; two PATA; AGP 8x; three PCI; 10/100 Ethernet; 5.1 AC'97 audio; TV out; IrDA port.



Using ATI's RADEON 9100 Pro IGP (based around the RADEON 9200), this micro ATX motherboard is packed with all the right features for a Home Theatre PC.

Great features that it's kitted with is S-Video and composite out, further cementing this board for the HTPC market. Having an onboard IrDA port is the cream to this motherboard. However, it doesn't actually come with an infra-red receiver – such as an RC kit.

It slams itself down as being built for the sole purpose of being the backbone to a solid HTPC. It would in fact certainly make for a powerful foundation to any system, with 800MHz FSB and four DIMM slots in dual channel, however also equipped with TV out, IR capabilities and an onboard IGP 9100 Pro, it would almost be a crying shame not to use them.

The onboard 3D video performance is relatively abysmal, but that's acceptable for its use – it wasn't made to be some virtual gaming mega-fest. Our Call of Duty time demo came in at an average of 12fps. Acceptable, but certainly nothing special for hardcore gaming. If using hefty 3D apps, the onboard 8x AGP port should be put to good use.

This mobo is a great collection of features, however there was the concern for heat levels. The onboard IGP/Northbridge was exceedingly high in temperature when in use – you wouldn't want to touch it for long under stress. Considering it has more processing power inside and it only uses passive cooling with the heatsink being smaller than the usual Northbridge chipset cooler and fan, we feel it could have been designed better.

Overall it's a kick-arse board, however there are two ways this mobo could be better.

Firstly, a decent onboard VIVO function would have everyone building a HTPC chasing after it. Secondly, better cooling's needed for the onboard 9100 Pro. Other than that, it's perfectly suited for just about any situation and price, and it's damn cheap for such a fully featured mobo. Ignoring the nasty heat issues, this is another decent ATI chipset-based board from Gigabyte. ND

SCORE **8.5/10**

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This work was inspired by my love of automobiles and the fantastic games of Need For Speed. The cars were modelled and rendered in 3Ds Max 6 and then the final details were added using Photoshop.

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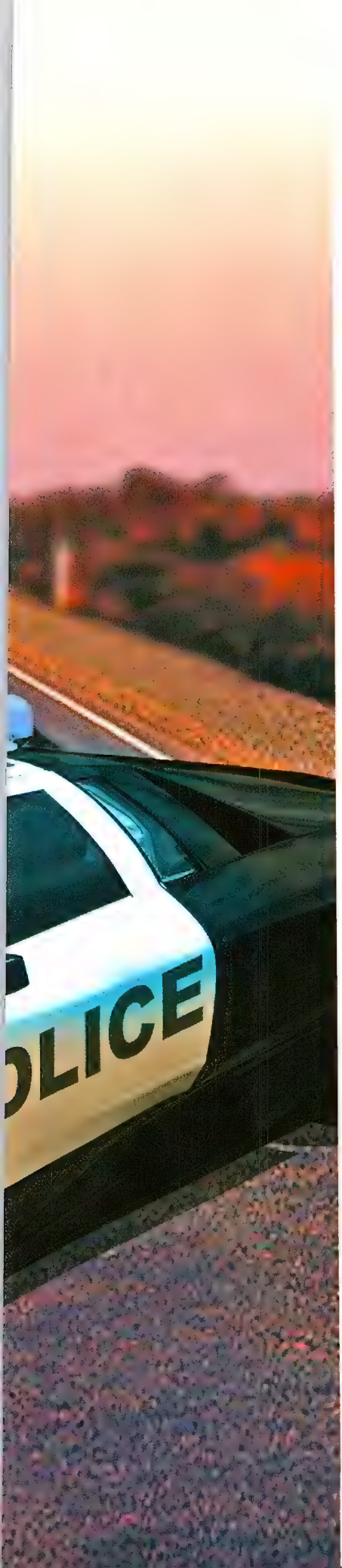
artomic@atomicmpc.com.au



Games

SCUMMbags

LucasArts used to make John Gillooly happy.

'All internal projects cancelled except one (don't remember the name, probably something to do with Star Wars); 50 people let go. Or, maybe I'm just making all this up because I'm bored...' So went the post on Ron Gilbert's Blog (www.grumpygamer.com) that let the world know that LucasArts were entering the endgame of the long running Jah Jah Binxing of the once fine company. In the end it turned out that 31 employees had been let go, following on from the 29 that had received the axe in April of this year.

LucasArts were once godlike, part of that elite crew of game studios that delivered the sort of games you just knew would be great. In my mind it used to sit alongside studios like Bullfrog, Blizzard, id software and Origin as deliverers of must buy games. But like the post Ultima IX: Ascension Origin or post High-Octane Bullfrog, the lustre created by games like The Secret of Monkey Island, Secret Weapons of the Luftwaffe and Outlaws started to fade.

In fact, in the early days of LucasArts (then known as LucasFilm Games) titles based upon the Star Wars license were forbidden; even though early titles like Rescue on Fractalus were Star Wars-esque, directly related titles were by no means bread and butter.

The first Star Wars title LucasArts made was Star Wars for the Nintendo Entertainment System back in 1992. By the start of 2004 it had successfully released over 35 different titles based upon the Star Wars Universe.

I remember cornering long running LucasArts PR head, Tom Sarris, at an event a few years ago where he responded to my 'What are you guys playing at?' rant with a well rehearsed 'We've learned our lessons'. At the time the once outstanding range of original Lucasarts titles had all but disappeared in a flurry of Star Wars-related shite, but things had been looking up with new Full Throttle and Secret Weapons games.

After former LucasArts president Simon Jeffrey left the company in October last year what appears to have been a turnaround in intent has stalled. Jeffrey, who is now living a much more peaceful life running the marketing department of model train maker Hornby, instigated a '50 percent' policy by which half the games made by LucasArts would be original IP and half based on the Star Wars/Indiana Jones licenses.

It was under this 50 percent regime that games like Sam and Max got the revival they so desperately deserved. Titles like Gladius and Wrath Unleashed were also part of this turnaround of a company that had just come off years of almost nothing but Star Wars themed titles.

Unfortunately this derailed when Jeffrey left LucasArts. Earlier this year Jim Ward was appointed as President of LucasArts, which he now juggles with his pre-existing role of vice president of Marketing and Distribution for LucasFilm.

Starting to see the picture emerge from the jigsaw puzzle? I severely doubt that this dovetailing of LucasArts and LucasFilm's marketing department will mean that we will see *Guybrush Threepwood: A Mighty Pirate's Tale* appearing at a cinema anytime soon, but I do get a nasty feeling we are in store for a renewed bombardment of Star Wars [insert generic genre based name here] titles over the next few years. Maybe I am being a bit too cynical, there may also be an Indiana Jones game or two as well, but it will be interesting to see if Pandemic's Mercenaries will be the last non-licensed title to appear with the LucasArts moniker.

The only real saving grace for LucasArts has been the slow realisation that outsourcing the license makes for better games. With companies like Raven revitalising the Jedi Knight franchise, this means that at least the quality of Star Wars titles will improve, but with the recent reshuffling of the company, don't expect to see much else for a while.

Scanner

ShortCircuits

When promoting new games, publishers often go to crazy lengths to impress. With Halo 2 due on the 9 November, Xbox went all out and sent the Master Chief over to the *Atomic* offices to spread the word. Normally we wouldn't cover it, but full credit has to go to the Master Chief, who showed a rock 'n' roll side we never knew existed. And we have photos to prove it.

The era of the first person RPG is definitely upon us. First we saw Troika license the Source engine from Valve for the upcoming Vampire The Masquerade: Bloodlines, then Bethesda let slip details of its fourth elder scrolls game, Oblivion, which succeeds the hugely popular Morrowind. Following this news, RPG legends Bioware revealed it had licensed the eagerly awaited Unreal Engine 3 to power an as yet unannounced RPG. We'll just wait and see the goods it delivers.

BUZZWORDIKAN

Preloading

A new term coined by Valve software in relation to Steam. It involves the downloading of game assets before a game is released, thus tempting users to download chunks of it then pay by credit card to play instantly, rather than purchase through retail channels.

Half-Life Sue

John Gillooly delves into the great Valve vs Vivendi sparring match.

At the time of writing the fate of Half-Life 2 is in the hands of Vivendi Universal's testing department, but as that milestone passed information started to appear about the background battle that has been fought between Valve and VU over their tempestuous publishing relationship.

It's no secret that Valve has pissed off VU on several occasions during the development of Half-Life 2. Not only is Valve working on its own distribution, licensing and authentication system, Steam, but it also made its now legendary bundling deal with ATI's RADEON 9800XT and 9600XT video cards last year. Both of these developments ended up taking money from VU's bottom line, not something a publisher wishes to happen with one of the most anticipated games of all time.

There have been legal skirmishes happening for years between the two companies, mainly revolving around the rights to the Half-Life franchise and the implications of Counter-Strike's success. Valve initially sued Vivendi over the fact it was selling Half-Life to LAN cafes, alleging that this infringed upon copyright and violated the publishing agreement between the companies.

Since that case was filed in 2002 Valve has also added failure to pay royalties and delaying Counter-Strike: Condition Zero to its list of gripes. In that fine American tradition Vivendi is counter-suing Valve for distributing its games via Steam. VU also alleges that Valve deliberately downplayed the role of Steam early in its development and is looking for access to the Half-Life 2 source code so it can get a clearer picture of Steam's development.

VU also alleges that its initial publishing agreement granted it the intellectual property rights to the Half-Life franchise, and when it renegotiated the deal in 2001 it gave Valve the intellectual property rights back as well as rights to online distribution. VU says it didn't know the plans Valve had for Steam, and the potential for it to damage VU's revenue.

It is a legal battle that won't come close to resolution until a jury trial scheduled for March 2005, but its ramifications will undoubtedly be huge. Talk to people close to Valve and they acknowledge that despite the perception of 'fun' that comes from Valve being a games developer, it is definitely a company with high aspirations.

If the creativity and shrewd deployment of Steam continue Valve could well be the first online game publisher to break into the mainstream consciousness. Conspiracy theorists would see the preloading of Half-Life 2 as a masterstroke of stealthy pre-ordering, and the fact that a purchase when the game launches could mean instant gameplay is a lure that hooks a lot of gamers.

No matter who eventually wins the case, the battle is far from over. Considering that at heart lies the rights to what is widely known as the finest first person shooter ever released, as well as the globally dominant multiplayer game, neither party will give up without a fight. While the battle will probably not affect the launch of Half-Life 2 it is easy to see this game complicating things even more as both sides work out and adapt to the impact Steam has had on traditional retail.

Developer Quote of the Month

'We also hope to get their undying respect and admiration for being dumb enough to try this and risk having the secret retail packaged goods ninjas come crashing through our ceiling to leave our headless corpses for the cleaning crew to find.'

Gabe Newell re: other developers using Steam in a 2002 interview with HomeLAN.

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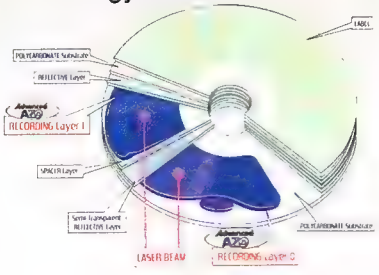

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Hooked on heroics

Heroic John Gillooly gets a lesson in role-playing Fable style.

Freedom of choice is oft touted as a feature of role playing titles, but a lot of the time this has little real impact on the player's experience in the world. Side quests may help build experience or reward with rare items, but in the end the game plays out pretty much the same whether you fully explore the choices and missions or not.

When Big Blue Box, under the guiding hand of Peter Molyneux's Lionhead Studios, started work on an RPG called Project Ego it wanted to change the way people experience role playing games. In essence it aimed to create a title that would engage people, and make them truly feel like the hero that they become over the course of the game. As Dene Carter from Big Blue Box puts it, 'The key thing we felt Fable needed to do was reflect the players' personalities and play-style in ways that made sense as human beings, not game-players. Too many games rely on the usual Dungeons and Dragons style statistics. We wanted to use ideas people who'd never consider playing an RPG would understand: scars, suntans and even flab all have a role to play in the game, and the way a player thinks about his hero's personality.'

Even though the working title was abandoned in favour of the name Fable, the Ego aspect is still intrinsic to the way the game works, and most of the true enjoyment to be had in this Xbox RPG comes from exploring the choices and consequences put in front of your constantly evolving character as he journeys through the world of Albion.

Growth not creation

'To begin with, the hero is an unknown. He'll be dressed in fairly bland clothing, and have a rather unbecoming haircut. People will rarely even look at him, let alone show enough interest to talk about him. As he goes through the game, he will perform deeds that raise his renown (for good or ill). People will begin looking at him more, and start to comment on various aspects of his character and looks: how scary, handsome he looks, and how ruthless a reputation he has, for example. As the player continues through the game, he'll slowly customise his hero, and more haircuts, tattoos and clothing will become available, and his experiences will alter pretty much every aspect of his physiology (eg: If he eats too many high calorie foods – or beer – he'll become fatter).'

Carter's take on the way a character develops differs a lot from widely accepted role playing 'systems' like d20 (used for Advanced Dungeons and Dragons and similar games) or SPECIAL (used for Fallout and Lionheart). In these a character class is chosen, then attributes assigned and the tried and true levelling up system takes over from there.

TOP: Fable's look and feel is very fairytale, as this concept art demonstrates. **ABOVE:** The alignment of a character is reflected in his physical.

BELOW: Not just a lifestyle simulation, it also features the obligatory giant monster.

'I think our chief differentiating factor is that our focus is different: we want to encourage players to "play themselves" in a fantasy world, rather than a specific character we've created, hence the lack of jobs, classes and usual role-playing categorisations. This also means that you don't get a choice of characters at the start of the game. This is highly unusual in RPGs, but we felt it went against the idea of continuous development that we were trying to encourage,' says Carter.

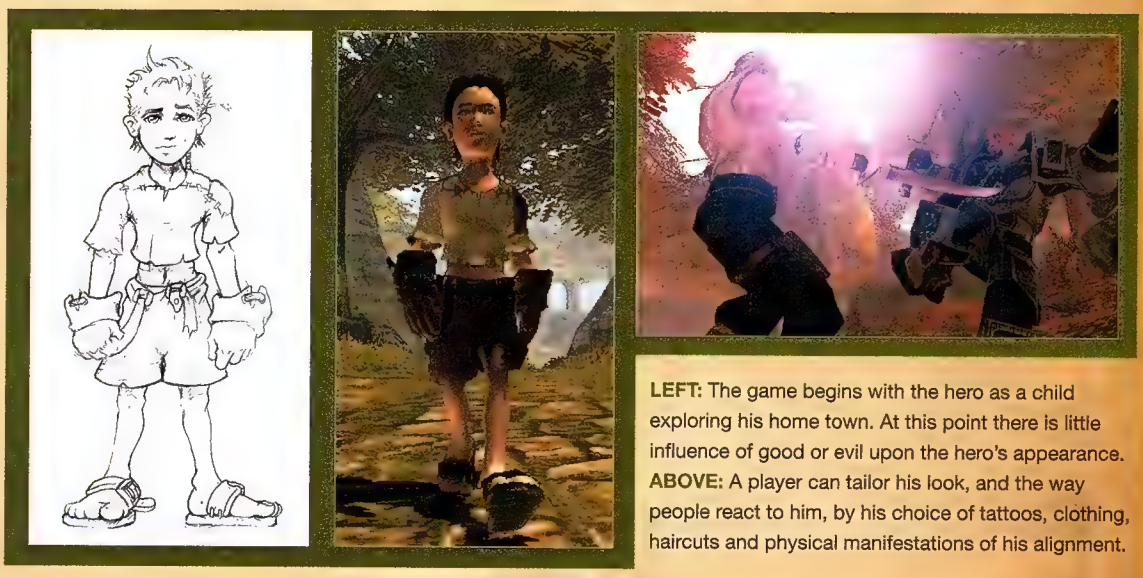
As the concept of character levels don't exist experience is earned as the character progresses through the game and can then be assigned to various things like strength, magic or ranged weaponry skills. Most of these areas then feed back into the alignment of the character and their all important physical appearance.

'By the end of the game, the hero is usually moving toward one of two extremes: either a being of wonder and light, with golden hair and an angelic halo of light denoting his innate goodness, or alternatively a foul creature with hellfire-scorched limbs and black chitinous horns bursting through his skull as a warning to all who might cross him,' explains Carter 'However, whether he's fat, thin, bearded, dressed in rags or armour (or even naked) with a Mohawk or a buzz-cut is up to you. You can wield a frying pan, a bow, a huge axe or a katana. You can become a master of swiftness and accuracy, brute strength, or pyrotechnic power, or any mixture of all of the above.'

Discovering exactly how you will eventually look is one of the main draws of the game: no two players' heroes are exactly alike.'

Physical manifestations

With so many options for player appearances in Fable, serious consideration needed to be given to the main character model and how clothing, haircuts and body shape evolved over the course of the game. After all, this isn't Baldurs Gate, and as the hero's body is actually a reflection of his experience it needs to not just look good, but inspire a sense of kinship with the player.



LEFT: The game begins with the hero as a child exploring his home town. At this point there is little influence of good or evil upon the hero's appearance. **ABOVE:** A player can tailor his look, and the way people react to him, by his choice of tattoos, clothing, haircuts and physical manifestations of his alignment.

'Allowing this freeform mix-and-match morphing was a real technical challenge. Every section of the hero is created separately: head, abdomen, hands, legs, feet, hair etc. Any time someone wants to create a new piece of any costume or a haircut, they have to model it to precise specifications, or problems develop later on when we apply the morphs,' continues Carter. 'The hero has to look solid (and cool), in all permutations of clothing, haircuts etc, regardless of the deformations we apply to his body. This in turn has a knock-on effect on other aspects of the game, like animation. How do you animate a character interacting with the world – when he could be anything from five to seven feet tall – without using a huge number of animations to deal with the different hand positions that result? It's not easy, and we had to choose simple cheats to accommodate a lot of the interactions. Even the hero's eyes have to be programmed individually to ensure that when we want him to look at something he doesn't stare over the top of it because he's grown!'

ABOVE: Graphically the game makes subtle use of the pixel shading hardware in Xbox, with a heavy emphasis on bloom effects and spangley magic like this nymph.

Good / bad or just plain inhuman

The testing process for the game featured constant surprises, and a few insights into the nastier side of human nature. Carter points out an example: 'We had to reduce some of the players' more extreme options: we really couldn't allow child-death in the game. We actually catered for child-death on some early tests, and we ended up with testers taking screenshots of some horrific moments I don't think anyone playing the game would want to experience.'

The removal of such an extreme feature is one of the few occasions when developers limited freedom of choice, there's still potential for extreme evil, as Carter explains: 'You can lay waste to an entire town, buy up all the land and then charge new residents for living in *your* houses. This is the sort of thing you only see in cinema villains who stroke white cats.'

In fact, the very free form nature of the game means that new situations keep cropping up; Carter also talks about some more surprises that stemmed from testing. 'I've watched someone play "keepie uppie" with a human head for several minutes. I've seen people misuse a spell while playing a game of cards (something we didn't think was possible). I've seen someone become so jealous of his wife's flirtatious nature that he flirted with another man's girlfriend, and then ended up in a fight with her enraged partner. The town guards became involved and, tragically, his wife died in the fight. The player was so mortified they lay waste to the entire town. Now that's not something you see every day...'

These choices in the design process have led to a gaming experience unlike any other. Freedom of choice is key in Fable and its implementation means that the game is more rewarding if you don't just try to complete the quests, but also stop to smell the roses.

It's an ambitious title, especially for developers with no RPG experience, but it delivers on the promise of freedom of choice and immersion, as Carter proudly boasts. 'Throughout the game there are countless opportunities to save innocents from danger, or take the side of the assailants. The real fun is in finding out how far you can push our simulation, and to see which interactions and circumstances the artificial intelligence recognises. Being evil only really feels evil when you have people reacting to you appropriately.'

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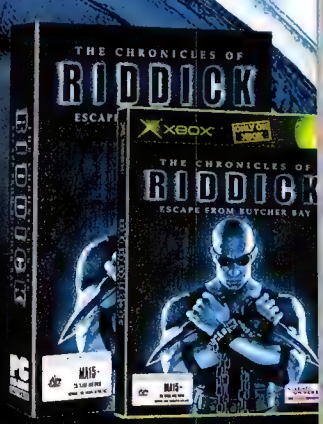

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www.vugames.com.au

Fable

John Gillooly finds an RPG that's chicken kickin' good.

Developer:
Big Blue Box
www.bigbluebox.com

Publisher:
Microsoft
www.microsoft.com.au

Distributor:
Microsoft
www.microsoft.com.au

Phone:
Microsoft
13 20 58

☺ Wonderful fantasy world with a real feeling of involvement.

☹ Occasionally frustrating ranged combat controls.

ABOVE: Fable is a rarity, a game requiring actual role playing.

ABOVE: 'I gotta find me a barber, this hair's weighing me down.'

It seemed so insignificant, my hero's hair was a bit ratty so I swung by the barber shop on my way through town. Snip, snip and the old cool hairdo was gone, replaced with one that just wasn't up to scratch. Cue hours of searching the length and breadth for a barber who could make it just right again.

Fable is a rarity, an RPG that requires actual role playing to make the most of it. For you are the centre of the game in a way that goes beyond mere storyline. It is a game in which a hero is treated like one, rather than the standard fare of drifting through a world that seems neither to care nor even acknowledge any of your mighty deeds.

The game starts with you as a child, faced with some simple decisions as you explore your home town of Oakvale. It is part of a tutorial that gently walks you through the early stages of the game, and sets up what becomes a great story arc about a boy growing to become a famous hero and of course meet his destiny (it is an RPG after all).

The story then jumps quickly through several stages of youth and into adulthood, where the game opens up and you begin your journey through the world of Albion. You receive quests that can be completed for money, experience and renown. The higher your renown level becomes, the more people will swoon at the mere sight of you, the hero, entering their small town – or cringe as your evil countenance strikes fear into their hearts.

ABOVE: Don the sword, appreciate the scenery, make like a hero.

It's bizarre that the two RPGS that stand heads and shoulders over the others on Xbox are Star Wars: Knights of The Old Republic and Fable, and both centre largely on morality and the choice between good and evil. (We are not even starting down the 'morality tales published by Microsoft' path.)

There are so many cool things you can do in Fable – you don't have to do any of them to complete the main quest, but isn't role playing all about becoming your character? If you do stop to smell the roses you can get eminently sidetracked, hours can be spent trying to kick chickens record distances and buying a house and getting married to one of your adoring female fans is but one particular frivolity that can send you off on a tangent.

Despite the fact that it has a quite gentle nature, and a very fairytale feel, the combat in Fable is awesome. It gets that brilliant combination of control and feel down, and apart from some niggles with the ranged targeting system, it is a sheer delight to wade through hordes of enemies. There are two main classes of weapons – you can fight with a melee weapon like a sword, axe or hammer (which gets more and more over the top as your character develops) or you can use a bow for ranged combat.

ABOVE: No place like a hero's home in good ol' Oakvale.

Magic also features heavily in the game and even those who aren't pure magic users will find themselves fixating on certain spells. For example, melee fighters will want to pump experience into the Beserk spell, which turns your hero into a faster, stronger mass with enormously increased arse kicking potential.

Big Blue Box and Lionhead have delivered a truly delightful game. While some will hack and slash their way through the adventure and miss most of its charm, those that take a little time in the world of Albion will soon know the sheer joy that comes from becoming a legendary hero.

SCORE **9.5/10**

Resident Evil: Outbreak

With shotgun handy, Logan Booker clears out some evil residents.

PS2 Specs

Developer:
Capcom
www.capcom.com

Publisher:
Capcom
www.capcom.com

Distributor:
THQ
www.thq.com.au

Phone:
THQ
(03) 9573 9200

☺ Amazing intro cinematic; solid survival horror gameplay; decent replayability.

☹ Noticeably absent multiplayer component; mediocre AI; NPCs detract from survival horror feel.

ABOVE: Train staff get nasty, infected and undead.

Resident Evil: Outbreak is Capcom's latest contribution to its series of survival horror titles involving the Machiavellian pharmaceutical company Umbrella and its infamous zombifying T-virus. Outbreak takes place during the events in RE 3: Nemesis, and puts the player in the shoes of one of eight infected Raccoon City citizens, including a journalist, university student, security guard and plumber.

The game departs somewhat from the standard RE format of having the player bumble around lost and unarmed, by allowing you to run around with up to three non-player characters lost and unarmed. The strength, accuracy and speed of each character vary, as do their abilities. For instance, while Kevin Ryman, the cop, is a great shot and starts with a formidable gun, he's not much good for anything else.

In addition to your standard health bar, Outbreak also incorporates a virus gauge that slowly increases over the course of a scenario. It speeds up when you're attacked, and when it hits 100 percent, you die. And live again – only with an insatiable appetite.

Unlike previous RE titles that employ a linear story, Outbreak is composed of five scenarios, loosely linked together to form what some might call a 'plot'. As you complete each scenario, the next one is unlocked. The focus of Outbreak however is not on progression, but rather speed and efficiency, and players are rewarded with points that can be used to unlock special items and features by conserving ammo, keeping companions alive and staying upright themselves.

Unfortunately, the only real reason to choose a different character is to satisfy your own desire. Your choice has no impact on the story.

Ironically, the game's main gripe stems from its team component – survival horror just works better when the player is alone. Although many players complain when they're never able to interact with in-game characters, now that you can, it weakens the experience. It doesn't help that the AI is poor and you'll spend more time bailing out your team than actually making progress. Add to this the lack of the vaunted multiplayer component in the PAL/European version, and Outbreak overall is disappointing.

SCORE **6.5/10**

Burnout 3 Takedown

Smash, bash and crash with Ben Mansill.

PS2 Specs

Developer:
Criterion
www.criteriongames.com

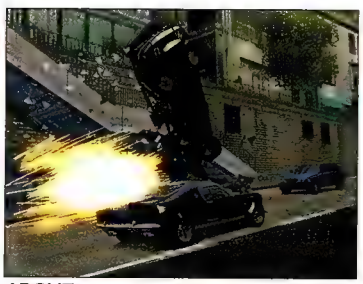
Publisher:
EA
www.electronic-arts.com.au

Distributor:
EA
www.electronic-arts.com.au

Phone:
EA
(02) 9264 8999

☺ A classic formula perfectly executed; fun guaranteed.

☹ Impossible to shake cheating AI cars; unnatural third person view.



ABOVE: Drive like a loon and bring chaos to the roads!

This is a game of precision destruction. A racing game it is, but unless you get good at the art of the smash you just won't progress. It's a beautifully designed, well-rounded game. In a market glut with arcade racers, Takedown gets through with innovation and polish.

The key to this game is the good old-fashioned boost button. It gives major acceleration, but doesn't come free. Through an event you'll generate boost by smashing, bashing and artfully driving like a loon. A balanced score structure hands out boost in various quantities based on how aggressive and skilful you are. Everything from airtime to powerslides, to taking your opponent out as creatively as possible. You simply need to smash to stay out in front. It's easy to run dry on boost so you'll be looking for things to sideswipe as you go, to stay near the front.

In the spirit of it all, bonus points are awarded for extreme trickery or danger, like taking out more than one bus in an event, or deliberately driving on the wrong side of the road. Do a legend pass at an intersection between two cars crossing and the game recognises and rewards it.

The game is unlock-city and it's not often you won't unlock something after every race. There are mountains of cars and a world of tracks.

Ultimately you score F1-style cars, but better are the road trains, fire trucks and the like. These heavy lumps are awesome for the stunt events, which are simply running off a ramp into a busy intersection with the sole intention of taking out as many other vehicles as you can for points.

It's worth noting that you really must drive in third person view – which I find unnatural. First person just doesn't allow you to see and thus aim for and smash nearby opponents easily.

The pace and chaos are totally addictive. For a racing game it's damn hard to mess up. The cars are almost indestructible and the tracks have convenient guiding fencing along almost all their lengths. You can be a bit sloppy, drive like a maniac and it almost rewards you for it!

This is definitely A-class arcade racing with an edge.

SCORE **8/10**

Star Wars: Battlefront

John Gillooly thinks he bent his wookie.

XBOX Specs

Developer:
Pandemic Studios
www.pandemicstudios.com

Publisher:
LucasArts
www.lucasarts.com

Distributor:
EA
www.electronic-arts.com.au

Phone:
EA
(02) 9264 8999

☺ Ewoks, wookies and stormtroopers!

☹ Average AI, doubtful single player longevity.

ABOVE: Finally a game where you get to be the Wookie!

With the slow cinematic death of the *Star Wars* franchise taking a brief hiatus, there are numerous game titles bearing the moniker in development. Star Wars Battlefront has been developed for LucasArts by Pandemic Studios creating a fast and fun vehicular shooter, even if it is little more than Battlefield 1942 with ewoks.

Yes, ewoks. Battlefront is split into two eras: the Galactic Civil War of episodes four to six and the Clone Wars of episodes one to three. This means that the famous locales like Hoth, Endor, Tatooine, Naboo, Kamino and Geneosis are all there. It also means classic vehicles like Speederbikes, Landspeeders, Tauntauns, AT-ATs, X-Wings and Tie fighters appear.

Single player is fun and the game gives a top-notch impression of being in the middle of the classic battles. This is helped by competent AI, which is certainly a leap from the gormless idiocy of BF1942's computer controlled players. Watching an AT-AT trundle closer and closer, or zipping a speederbike through the forests of Endor are wonderful experiences. You can play the game a map at a time, or play the galactic conquest mode in which you attack a series of enemy planets to gain special bonuses. These bonuses can then be used in subsequent battles to sway the course of history.

Both sides of the battles are playable, but one of the most interesting twists on the battlefield carbon copy nature of the game is that some maps feature a third team, for example on Tatooine there are Jawa camps and on Endor there are ewoks.

While the single player is a truckload of short-term fun, longevity with this game will come with Xbox Live. While the PC version may struggle in the bloated ranks of established shooters, this is a much more unique experience for Xbox, and is damn fun.

Star Wars Battlefront is a good, but not great, game. It trades heavily in nostalgia, which is its biggest strength, and certainly delivers some good, fun distraction. We will even forgive its uncanny similarities to Battlefield 1942. With this game indicative of a mean rise in quality of Star Wars titles, maybe there is still a glimmer of hope for LucasArts yet.

SCORE **8/10**

The Sims 2

Self confessed Sims geek Anna Gillooly gets ready to detach from society.

PC Specs

Developer
Maxis
www.maxis.com

Publisher:
EA
www.electronic-arts.com.au

Distributor:
EA
www.electronic-arts.com.au

Phone:
EA
(02) 9264 8999

☺ Huge improvements over the original with some key new features.

☹ At heart it is the same love-it or hate-it Sims gameplay.

ABOVE: 'I wonder if I've missed the pillow fight?' asks Mr Sims.

The Sims have finally evolved and joined us in the 21st century. Sim fans have been dreaming of this day since the Sims first came on the market, and we now believe that you can finally give up your own dreary life and live vicariously through your Sims.

The Sims 2 does take a little while to get into – there are so many new and improved features that it is a little overwhelming at first. Thankfully there are two tutorials to get you up to speed with the game. One is designed for new players and the other is designed for Sims geeks who already know the basics but need an overview of the added features.

One of the key new features is genetics. Sims now pass their genes through each generation, and finally your Sims age too. Babies grow into children, develop into teenagers, move into adulthood and eventually age and die. You can also customise physical features from the colour of a Sim's hair right down to how pointy their chin is.

Sims now have aspirations that they need to fulfill through their wants (positive experiences) and their fears (negative experiences). When you fulfill a want your Sim receives reward points, which can be traded in for reward objects in the rewards catalogue (we highly recommend the money tree). Besides this, Sims still need to study to get ahead in their careers and improve their quality of life.

You do need to keep an eye on your food supplies. If you run out your Sims cannot eat until you order more groceries on the internet, which incurs a $50 delivery charge so it's best to order up big every time to get your money's worth. And don't forget to check your email. Sims can now also meet new people in the chat rooms, be it for romance or friendship. In fact it is now very difficult for Sims to get by without owning a PC.

There are so many new features and interactions that you need to explore it for yourself. The Sims 2 builds wonderfully on the addictive nature of the original, delivering the perfect weapon of mass social life destruction.

hotaward

Requirements
600MHz CPU; DirectX 7 class video; 256MB RAM; 3.5GB HDD
Recommended
1.5GHz CPU; DirectX 8 class video; 512MB RAM.

SCORE **9.5/10**

Evil Genius

John Gillooly cracks a devilish grin and hatches world-dominating plans.

Developer:
Elixir
www.elixir-studios.co.uk

Publisher:
Vivendi Universal Games
www.vugames.com.au

Distributor:
Vivendi Universal Games
www.vugames.com.au

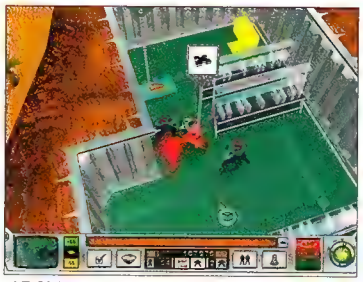
Phone:
Vivendi Universal Games
(02) 9978 7722

☺ Funny, quirky and deeply strategic return to the God game genre.

☹ Won't please those longing for direct control over lots of minions or fans of fast paced action.

ABOVE: Plan to take over the world with your data-inputting minions.

ABOVE: No one can bring themselves to look at the size of Mr Blue's pistol.



ABOVE: 'No! For the love of God man, anything but the funk dancing!'

No matter how altruistic the spin put on it, at heart everyone has plotted world domination at one point or another. The sheer concept of a weather machine is enough to spark devilishly creative thoughts in even the most timid of minds. Now you no longer need to become chief software architect of Microsoft to start enacting your nefarious plans, thanks to Elixir's delightfully offbeat Evil Genius.

This is 1960s James Bond camp at its finest, with you playing the bad guy. It is a god game of sorts, a spiritual successor to the heady successes that British gaming legends Bullfrog had with games like Dungeon Keeper, Theme Park and Theme Hospital. Gameplay is split between a realtime component in which you build your base and a world map through which you enact your evil schemes (cue maniacal laugh).

In the fine old tradition of god games this is not a direct control RTS. The only characters you can actually manipulate in your lair are your Evil Genius and Henchmen. You choose from one of three geniuses at the start of the game, each with different strengths and weaknesses. You then start with one Henchman, essentially a high level combat unit, and you can periodically send workers into the world to recruit new ones.

Base building involves creating and populating rooms with various types of furniture, all of which brings bonuses to play. There is a huge range of things to choose from, and more can be researched once you build a lab for your technicians. As you build your base you can recruit more lackeys, who all start in your employment as yellow jumpsuited workers and can be trained up to be security, research or domestic staff.

In order to do this you must capture workers in the world map and interrogate them. Interrogation takes many forms, the basic device is the interrogation chair in which captured workers are subjected to such horrors as cymbal clashing and horrific funk dancing by one of your minions, but there are other, more creative ways. For example, the food mixer in the kitchen is large enough to fit someone in the bowl.

But finding new types of workers is only a small part of the world map activity. It is used to send minions out into the world, to steal funds, plot and scheme, or perform missions discovered through your plotting. While not flashy, it is a simple but elegant interface and a large portion of the game is spent sending groups out to do such evil things as shrink the Eiffel Tower and bring it back to take pride of place in your lair.

Your efforts on the world map create both heat and notoriety. The more heat you bring down on yourself, the more likely it is that the Forces of Justice will send Agents to investigate your island. Agents come in many forms, from benign investigators through crack teams of saboteurs or assassins. But the biggest danger is from Super Agents, James Bond-level spies who hone in on your genius.

Most agents can be confused, captured or killed to stop them from reporting on your lair, however Super Agents cannot be obliterated. They can, however, have their special powers negated once you research their weaknesses.

Evil Genius is a truly wonderful and refreshing game. It is funny, deep and above all eminently enjoyable. This is a game that positively reeks of fun, something that is strangely lacking in a lot of modern games. Elixir has delivered the perfect game to break you out of the gloomy corridors that have dominated gaming of late.

Requirements
800MHz CPU; DX7 level video; 128MB RAM; 300MB HDD
Recommended
1.5GHz CPU; DX8 level video; 512MB RAM

SCORE 9/10

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"Best of E3"
IGN
(Most Innovative Design - 2004)

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PC ZONE

"Evil Genius is awesome!."
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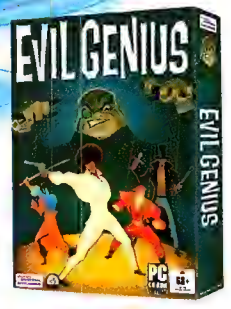

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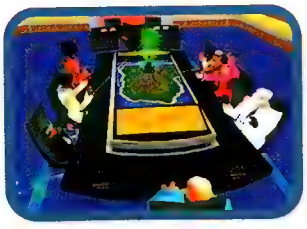

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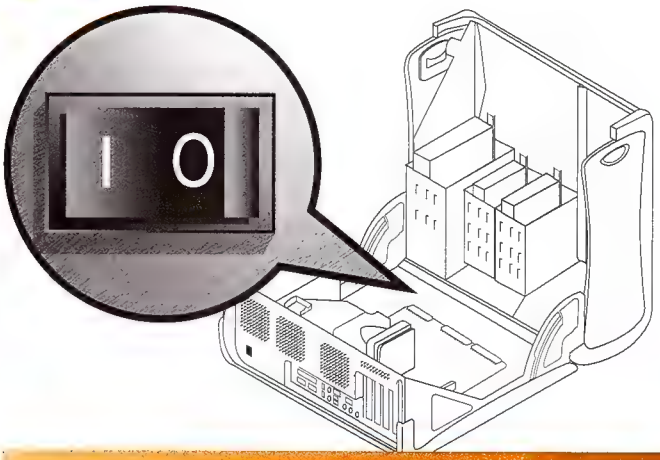


IO of the month wins a Logitech MX510!

Strawberry red for those special moments!
io@atomicmpc.com.au

IO OF THE MONTH

One switch for everything

I have an idea for a construction project that I hoped you might publish in your magazine. It's fairly simple really... modding a standard mains powerboard so that is controlled by the presence of power on a computer's USB port. Regular computer users might use this to automatically power up printers, speakers, and network equipment while Atomicans could use it for water pumps, 240V cooling fans.

I envisage installing a relay into the powerboard (with 5V coil and 240V contact rating), and connecting it to the computer via a USB cable. Although I could probably work out how to build this project without your help, I'd really like to avoid the possibility of killing myself. How about it?
Daniel Black

As you say, this can be done with a relay, and if you take adequate care with isolation then it shouldn't be dangerous.

A more intrinsically safe version of the same idea, though, has two sockets on it (from either of which you can hang a powerboard) and powers up the second socket when it detects power being drawn from the first. This keeps mains away from USB, and can also be used with all kinds of gadgets, not just computers. It's good for making a central power-up solution for a big home theatre setup, for instance.

Bear in mind, however, it's still eminently possible to crispify yourself while building and testing such a device, of course, but at least a failure while it's running ought not to barbecue your computer.

You'll be happy to learn that this product already exists, as a packaged kit: www.jaycar.com.au/productView.asp?ID=KC5363

HSF bling

Looking at all these new and wonderful coolers based on copper, I am wondering what is the next step in air cooling. Then it came to me: why not just use silver!

Silver is a better thermal conductor than copper, though I know it's expensive. But why not put a thin plate of silver under copper heat sinks to improve the thermal transfer? Just like some hybrid aluminium/copper (Zalman 6000ALCU, Volcano 9...) coolers. Why not do the same with silver?

If a little smear of Arctic Silver can reduce your temperature by a few degrees, what can a whole plate do?
Ken Sunny

Fine silver actually only conducts heat about 10 percent better than copper. Putting a plate of the stuff on the bottom of a copper heat sink is, therefore, pretty much pointless; you lose a little thermal conductivity in the joint between the two metals, there'll be some galvanic corrosion issues, silver itself is prone to corrosion, and fine silver is a pretty impractical material – it's terribly soft. That's good news for mating it to the top of a CPU, because it'll squish onto the top of the die and get a good thermal contact, but it makes it hard to mount fine silver onto anything else.

Interestingly, there's an alloy of 72 percent silver and 28 percent copper called 'CuSil' which is much harder than fine silver (so is sterling silver, which only has a maximum of 7.5 percent of other metals in it, usually copper), and is also supposed to have considerably better thermal conductivity than copper *or* silver. There's some doubt about whether this is actually true, though (www.overclockers.com/articles305).

In any case, there have been a few gimmicky coolers over the years that have had silver plates on the bottom. The most famous is Noisecontrol's 'Silverado', which married a silver disc with an aluminium heat sink, though largely for marketing reasons.

Size on disk, size on C64 Datasette...

In Windows XP, what is the difference between an object's 'size' and its 'size on disk'? A file or folder's Properties always shows two sizes, sometimes the same, sometimes different. Why?
Chris O'Hare

The size is the actual amount of data in the file; the size on disk is the amount of disk space it takes up. The second number is bigger because data on disks is divided up into 'clusters', which are the smallest allocation units available. The standard cluster size for NTFS disks is 4096 bytes; you'll notice that all files on such a disk have a 'size on disk' spec that's a multiple of 4096 bytes. Save a one byte file to such a disk, and it'll take up 4096 bytes; save a 4097 byte file, and it will take up 8192 bytes.

This extra space is known as 'slack' space. A file whose size is an exact multiple of cluster sizes, though, won't waste any space. It also doesn't matter if a file's fragmented.

Slack space used to be a big deal back in the days before FAT32, when disk space was more expensive and the FAT file system used 32KB clusters for partitions between 1GB and 2GB (and

couldn't handle larger partitions at all). Nowadays, though, huge disks are cheap and sensible file systems like NTFS can use small clusters even for big drives, so the issue of slack space very seldom becomes a problem.

Memory card booting

I Is there any way to put WinXP Pro on a flash drive so that the computer will start instantly?

Since it's only read access, will the flash drive last, or run out of its 'million' (or whatever) capacity read cycles?

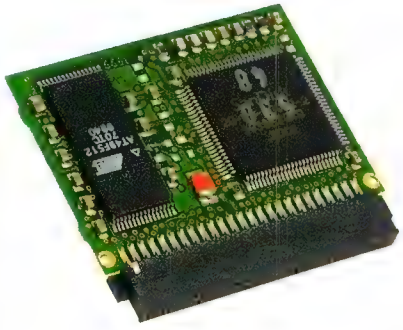
If PDAs can start up quickly, why can't PCs be made to do so?

Sunil Gonsalves

It is possible, but impractical. Possible, because it's easy to adapt a CompactFlash card into an IDE (ATA) device; all that's required is a passive pin-adaptor.

Impractical, however, because of the following reasons.

An XP Pro install is likely to be more than a gigabyte in size. CompactFlash cards have plunged in price lately, but you're still talking at least $400 for a 2GB card – around 150 times the price-per-megabyte of a hard drive. You can get those dodgy Magicstor 2.2GB



ABOVE: Hot nude CompactFlash action!

CompactFlash cards for well under US$200, but they're Microdrive clones, not flash memory, which of course defeats the purpose.

And, after paying that much, you wouldn't get instant startup anyway. CompactFlash cards in ATA mode only support PIO 4, which uses more CPU time than any of the DMA modes that all current ATA hard drives support, and can only shift data at a theoretical maximum of 16.7MB/s, which is rather slower than the sustained read speed of various high density consumer drives these days. In addition, the card may have its own overhead that makes the real transfer rate a lot lower.

The card has negligible seek time, which can be very handy for some things and certainly doesn't hurt for system startup, but the low transfer rate will kill the advantage.

And, even if that didn't bother you, you'd still need a hard drive to put your swap file on, because NT-series Windows flavours can't run without swap no matter how much physical RAM they've got. You can't put the swap file on the CompactFlash card, because of the limited write cycles the memory supports. You can, if you want to be a little devious, put the swap file on a RAM disk, but that doesn't actually improve system performance significantly.

PDAs have much smaller operating systems than desktop PCs. The total flash ROM capacity of a current high end Pocket PC is likely to be 64MB. You would probably need 20 of them to simply store just the files for a smallish WinXP install.

PDAs are also made to be able to suspend and resume their operation at a moment's notice, preserving the contents of their dynamic RAM with a trickle of battery power. When you start-up a PDA you're usually just waking it up into full power mode again, not booting it from scratch. PCs can do the same sort of thing with sleep and standby modes.

Still better than drinking it

I My friend was having an uninvited party in my home theatre room with his girlfriend. He spilled wine cooler into my Denon AVR-5700 receiver. Needless to say, I wasn't too happy about this and after about a week I took the receiver in to an authorised Denon service centre. They've now had it for three months, and have no clue what's wrong with it. They say that all the metal is corroded and even eaten away by the wine cooler in the small area that it dripped in, that I waited too long to bring it into the store, and that it may not be fixable for a reasonable price.

The repairer's suggesting all sorts of new expensive parts. Is this guy incompetent, or does wine cooler really corrode metal and cause that much damage to circuitry?

Jonathan

After a week, yes, it could really be that bad.

Wine cooler contains wine and fruit juice (rumours concerning the presence of human or animal urine remain unconfirmed), both of which are acidic. It's usually diluted enough that you could probably get away with leaving it on an average circuit board for a few hours, but after a week it's quite plausible that the board will be toast.

ABOVE: Wine cooler + circuitry = bad news.

I don't know the actual corrosion capability of an average wine cooler compared with more common electronics-killing liquids (cola, for instance), but all acidic liquids are simply bad news.

Plain water, however, is not. Lots of gadgets that've been doused with water, even while they were turned on, can be rehabilitated by just taking them apart and drying them out.

The standard treatment for a gadget that's been accidentally drenched in cola or whatever is to wash its parts thoroughly with clean water, optionally followed by squirts of alcohol into any crevices, to displace the water.

But if there's already a patch of rusted-out circuit board, and the board itself can't be cheaply replaced, you're pretty much screwed. DR

Wine cooler contains wine and fruit juice (rumours concerning the presence of urine remain unconfirmed), both of which are acidic. It's diluted enough that you could probably get away with leaving it on an average circuit board for a few hours, but after a week it's quite plausible the board will be toast.

Simon Peppercorn gets his priorities in order...finally!

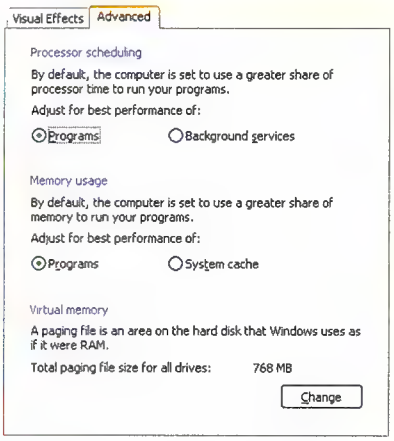
Depending on the priority of any given process, varying amounts of processor time are allocated to threads within that process. Processes are made up of a bunch of threads, all waiting their turn for access to the CPU. In the dark days of ye olde WinNT we could adjust thread priority with the choices 'none', 'balanced' and 'maximum'. These settings did nothing to affect the allocation of timeslices.

With the modern day wonders of the Windows 2000 registry, we are now able to control whether the length of time allocated to a thread/process is fixed or variable, and even specify the length of time itself, kinda.

To explain: the length of time a thread runs is called a 'quantum'. A quantum isn't defined as a time value; rather it is given an integer that specifies a number of relative quantum units. A thread is allowed to run for that quantum value until it expires or is interrupted and its priority level compared against other threads waiting to run.

A full quantum may not be reached as some threads of higher priorities may be pre-empted. Some threads may even voluntarily give up their position in favour of threads of higher priority by temporarily switching to a wait state, and are rescheduled for later processing. This scheduling is determined by the Win32 API and the kernel.

The Win32 API manages process priority based on the class it was assigned when created (realtime, high, above normal, normal, below normal, and idle). It then looks at each individual thread within that process in terms of it relative priority



ABOVE: Default isn't always best.

(time-critical, highest, above normal, normal, below normal, lowest, and idle).

The base priority of these processes can be managed by the user through Task Manager by right clicking on a process and selecting a level, although generally this is handled without user intervention.

Windows 2000 uses 32 levels of priority, from 0 to 31. Levels 1 to 15 are variable, 16-32 are realtime levels and '0' is reserved for the zero page thread.

The role of the kernel in all of this is to maintain a database of all waiting threads and their parent processes. This database is known as the 'dispatcher database'. It allows for the proper scheduling of threads and proper decision-making when it comes to thread priority.

It's as easy as ABC

A foreground process is simply the process that is currently in focus. If the focus is changed to a window that holds a process that is higher than the idle priority class, the quantums for all the threads in that process are adjusted as defined by the Win32PriortySubsystem key. This key can be found in HKLM\SYSTEM\CurrentControlSet\Control\PriorityControl. It allows us to control the Quantum values by specifying the relative length, whether to boost the quantums of foreground or background processes.

First, it's important to determine how much relative time to allocate to foreground processes. The key is represented as a 6-bit bitmask in the form AABBCC. The AA determines the relative length of the processor interval. BB specifies whether the interval is variable or fixed. CC controls foreground/background priority order. We can't give AA an exact value, as threads may be pre-empted and so processor time can only be relative figure, defined as 'shorter' or 'longer'. Use these tables as a guide:

First two bits:

Value	
01	Longer intervals
10	Shorter intervals

Middle two bits:

Value	
01	Variable-length intervals
10	Fixed-length intervals

Last two bits:

Value	
00	Equal and fixed.
01	2:1 Foreground to background priority
10 or 11	3:1 Foreground to background priority

In most Windows 2000 Professional situations, (Windows 2000 Server uses different values) a bitmask of 011010 would give best performance for foreground process. This is derived from longer quantum units with a fixed length, in which foreground processes get 3:1 priority over background process.

The trade off is that background processes take a significant performance hit, but who performs intense spreadsheet calculations while shooting zombies around a Mars research station?

However, the GUI which allows us to direct the priority of foreground and background processes only provides for two possibilities. This limitation results in bitmasks of either 100110, which provides short, variable length processor intervals with 3:1 priority *or* 011000, for longer, fixed-length processor intervals with equal priority.

So we need to edit the value directly in the registry to create the bitmask we want. Digging out our old trusty binary to decimal calculator, we find that 011010 converts to a value of 26.

The other way to calculate this is to start with a decimal value of 0. If you want the ratio of foreground to background process to be 3:1 then add 2. If you prefer 2:1 add 1. If you want to set fixed quantum lengths then add 8. For variable, add 4. For shorter quantum units, add 32.

For longer units, add 16. Using the recommended scenario of 3:1, fixed length, longer quantums, we again end up with 26!

So this, ladies and gentlemen, is the best value we can give to the WinPrioritySubsystem key to help optimise performance. Phew!

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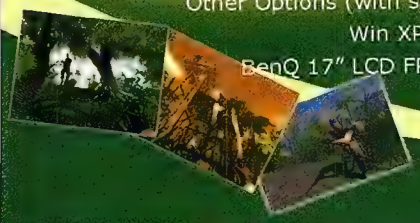

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Peter Sbarski offers a peek at the power of the Linux command line.

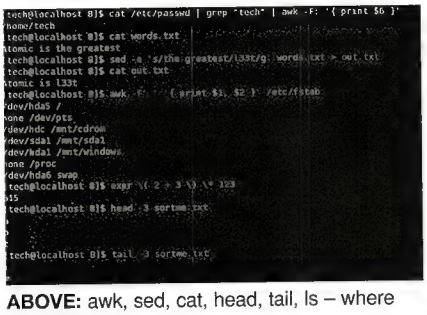
All Linux distributions come with a myriad of tools and utilities. While they are easily accessible from a command line, many users simply don't know they exist. With this in mind we bring you the best Linux tools that you may not know about but really ought to.

Note that some of the utilities described below may not be applicable to your distribution.

AWK/GAWK/NAWK

AWK is an excellent pattern scripting and processing language used predominantly with shell scripting. GAWK and NAWK are two versions of AWK that are fully compatible with it. Example: to display all devices and their mount points in your /etc/fstab file use:

```
awk -F' ' '{ print $1, $2 }' /etc/fstab
```



ABOVE: awk, sed, cat, head, tail, ls – where would we be without them?

SED

SED is a stream editor that modifies its input line by line. It is very good at deleting, substituting, searching and it works well with regular expressions. Example: if you have a file with the words '*Atomic* is the greatest' to replace 'the greatest' with 'l33t' and produce a new file called out.txt use: `sed -e 's/the greatest/l33t/g' words.txt > out.txt`

a2p, s2p

a2p is a little program that takes an AWK script and produces equivalent Perl code. The code is dumped straight to standard output so you need to redirect it to another file. Although it is very robust a2p sometimes has to make guesses on how to convert AWK code to Perl. A lot of the time it does it right but it is still a very good idea to manually verify the code. A similar, in purpose, utility s2p converts SED code to Perl. Syntax: `a2p [options] <filename>`, `s2p [options] <filename>`

apropos

The apropos utility searches all man pages and program descriptions for a given keyword. It then dumps everything it has found to standard output. Each line dumped by apropos has the name of the man page where the keyword appears, the section (in brackets) of the man page where it happened and a short description. In reality apropos uses the whatis database to do its search. The whatis database is generated by scanning man pages. You can either use a single keyword with apropos or a regular expression. The syntax here is: `apropos <keyword>`

expr

You don't need a GUI calculator to do multiplication, division, addition or subtraction. Use the inbuilt expr utility. This calculator is pretty basic but it can evaluate non-numeric character strings and it can be used quite effectively in a shell script. Example: `expr \( 2 + 3 \) \* 123`, note that you must precede brackets and the multiplication sign with a backslash.

file

If you need to know the type of a particular file you can try to find it out by using file. The file command will tell you whether something is a shell script, an executable, an image, a text file, etc. Using file is a little bit better than relying solely on the extension. Syntax: `file <filename>`

whatis

If you don't know what a particular command or a program does whatis is what you need to use. This utility prints a small description of the command you are trying to find out about. This information is actually acquired from an appropriate man page. For example, if you try, `whatis ls` you will see 'ls (1) – list directory contents'. Syntax: `whatis <command>`

grep

Everyone should know how to use grep. It is an excellent pattern matching tool. Like most other Linux utilities and tools it has a huge number of options and it supports regular expressions. Example: to find the line referencing user 'tech', with grep, in /etc/passwd and extract his home directory with awk one would do the following: `cat /etc/passwd | grep "tech" | awk -F: '{ print $6 }'`

which

which reveals the full path of a command. When you run a command, the directories in the path (try `echo $PATH`) are scanned and if the required command is found it is executed. You may also happen to have commands of the same name in different directories. The shell will then execute the first one it finds. If you want to work out which directory is found first and then subsequently which file is executed - use which. Basically this utility will print out the full path to an executable if it can find it in the path statement. The syntax here is: `which <command>`

head

The head command displays the start of the file. The amount of lines to be displayed from the top is specified by the first parameter (for example, to see the first 5 lines, use -5). Syntax: `head [-number] <file>`

tail

The tail utility is the opposite of the head utility. It displays the end of the file. For example, to display the last 5 lines from the end you would specify -5 as the first parameter. The syntax here is: `tail [-number] <file>`

od

od is used to dump contents of a file in various formats. You can produce a character (-c), a decimal (-d), an octal (-o) or a hexadecimal (-x) dump. If you don't supply an option, od will dump file contents in octal. Syntax: `od [options] <filename>`

These are just a few of the more interesting commands at your disposal. If they've piqued your interest, you can always go exploring your /bin and /sbin directories to see what other gems.

linuxtweaks@atomicmpc.com.au

Securely yours

Leigh Dyer shows you how to keep your emails, files, and pets safe through the wonderful world of encryption.

In the prehistoric 1980s, when the web had yet to appear and only rich cavemen could afford internet access, people kept their files secure using a free tool called Pretty Good Privacy, or PGP. Development of PGP continues today, but corporate interests, patent issues and export restrictions have taken their toll on its usefulness.

To fix the problems inherent in PGP, the OpenPGP standard was developed, and a new program, called the GNU Privacy Guard, or GPG, was created to implement this standard. GPG is open source software and uses only patent-free algorithms, avoiding the issues that limit use of PGP today. If you're interested in protecting information, either for your own peace of mind or for safe transmission across the internet, GPG is your ticket to security and privacy, and at no cost!

Crypto basics

GPG uses a system known as *public-key cryptography*. Instead of having a single secret key that's used to both encrypt and decrypt information, public-key ciphers use two separate keys: a public key used to encrypt, and a private key used to decrypt. You're free to give out the public key to anyone who wants to send you encrypted messages, safe in the knowledge that only your private key, which you keep secure, can decrypt them.

Public-key cryptography also lets you digitally sign data, letting people verify that you were the author. You sign the data with your private key, and others can then verify the data by checking the signature against your public key. This is perfect for email, with all the From: header forging that happens these days – by signing all of your outgoing mail, anyone with GPG set up can easily verify whether an email really has come from you.

GPG and Windows

The best way to install GPG on Windows is to use a package called WinPT. It bundles the standard GPG command-line utilities with a nice GUI, including a system tray app that gives you easy access to GPG at all times. Follow these steps to get started:

1. Grab the WinPT installer file from winpt.sf.net

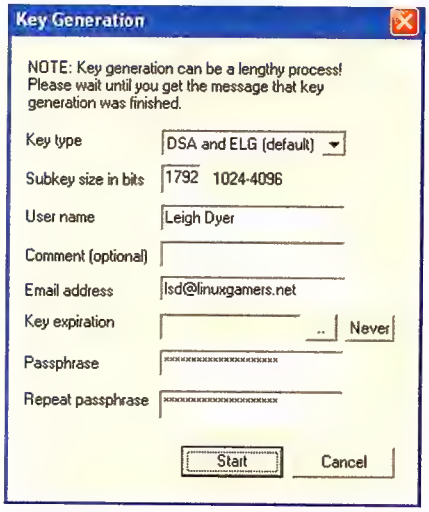
2. Run through the installer. There's nothing too tricky – just make sure you install the Outlook Express plug-in if you want to use it later.

3. When you run WinPT Tray for the first time you'll see a message warning you that something is wrong with your GPG keyrings. Don't worry about this, it's just referring to the fact that you don't yet have a keyring. Click Yes to start the configuration process.

4. The first step in configuration is to get a key pair. If you've got an existing GPG or PGP keyring, you can import it, but you'll most likely want to generate a new key pair, so select that option and click OK.

5. In the Key Generation dialog, stick with the default DSA and ELG key type, and unless you're extremely paranoid, stick with the default keysize too. Enter in your full name and email address, and a good passphrase. The passphrase protects your private key, preventing anyone who might manage to steal your private key from being able to use it, so it's a good idea to use something long and unpredictable. Hit Start to generate the key.

6. Once the key is generated, WinPT will ask if you want to save a backup copy of it. This is a good idea, since if you lost your private key you'd be unable to decrypt any files encrypted with your public key. Either way, you and your new GPG setup are now ready to go!



ABOVE: Generating your public/private keypair with WinPT.

WinPT installs Explorer extensions that let you easily encrypt and sign your files. To encrypt a file, right click on it and select Encrypt from the WinPT submenu. In the dialog that appears, select the public key to use for encryption (unless you've imported other public keys, you'll only have your own) and click OK. The encrypted file will be written out with a '.gpg' extension added on to the filename.

To decrypt the file that's been encrypted using your public key, just double click the encrypted file and enter your passphrase when prompted.

Signing files with your private key is just as easy. Right click on the file in Explorer and select the Sign option from the WinPT menu. Select your private key from the list and enter your passphrase. Leave the 'Detached Signature' option enabled – otherwise GPG will write the original file and the signature together in to a new file that only GPG can extract, rather than saving just the signature to a separate file and leaving the original untouched.

The web of trust

Encrypting your own files for safe-keeping is all well and good, but GPG is designed to be used with friends. By sharing your public key and getting copies of other people's public keys, you can encrypt files to send and verify signed files sent to you.

To facilitate all this, there are a number of keyservers on the net, which hold searchable databases of public keys. You can upload your key to a keyserver, and search the keyserver to find your friends' keys.

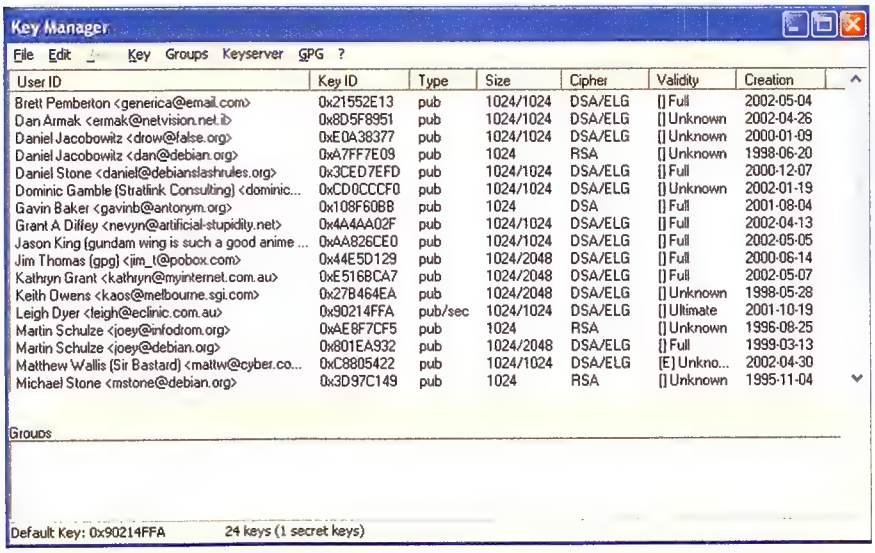
However, having a copy of someone's public key means little unless you have trust in the fact that the key you have really belongs to the right person. The ideal way to exchange public keys is in person, but that's not always easy, or possible, so GPG uses the concept of a *web of trust*, where keys are validated by other users in a distributed manner.

Validating a public key and its owner is done by signing the key with your private key. This signature is then distributed as part of the key, showing to others that you believe the key to be valid. When you import a key, you can see the other users that have validated and signed the key.

However, that validation means little unless you trust the person doing the validation, so you must have trust in the people that have signed a key for it to appear valid. For each key that you sign, you can decide to trust the owner fully, marginally, or not at all. Any key signed by someone you trust fully, or three people you trust marginally, will be considered valid, just as if you'd signed it yourself.

It's important to distinguish between trust and validity. Validating a key simply means that you trust that the key truly represents the person it claims to. Trusting a key means that you trust the key's owner to properly validate the keys of others. It's really a trust in the person, rather than the key.

Importing, signing, and assigning levels of trust to keys is done through the Key Manager, which you can open from the WinPT system tray icon's right click menu.



ABOVE: The key manager, where you can import, edit, validate and assign trust to keys.

To import a key from a file, select Import from the Key menu, or to search for a key online, open the Keyserver menu, enter an email address and hit Search. Every key you import will appear in the key list in the main window, along with your own key.

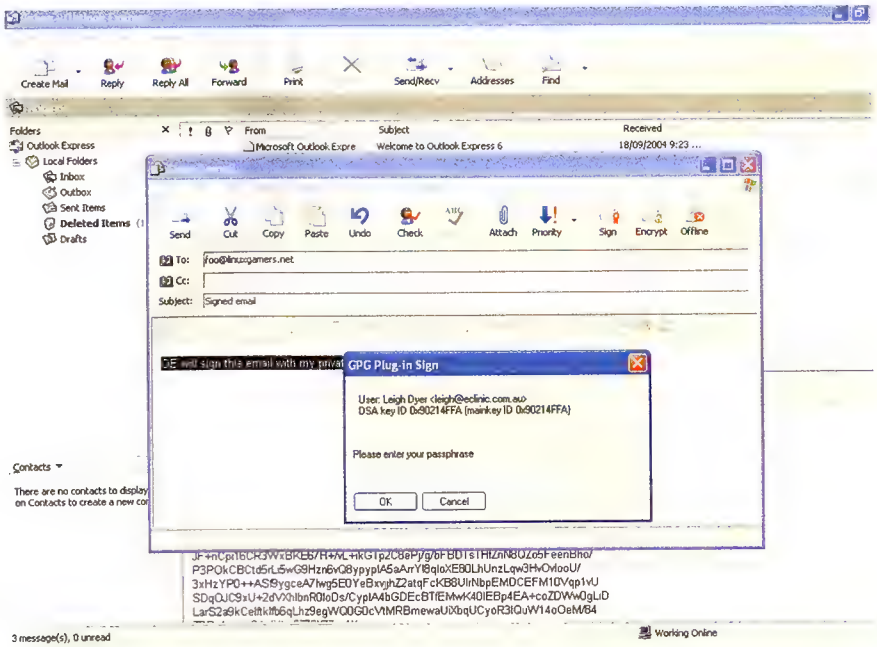
To sign a key, right click on it and select Sign, and then enter your passphrase. You can then assign a level of trust to the key by right clicking on it and selecting Key Properties. Under Ownertrust, hit the Change button and select the proper level of trust.

You've got mail

One of the nicest applications for GPG is, naturally, email. GPG lets you encrypt messages to keep them private, or sign them to prove their authenticity. You can also do both, so that people receiving encrypted mail from you can be sure it really is from you.

WinPT comes with a simple Outlook Express plug-in, which works by hijacking OE's support for S/MIME (another mail crypto system) and hooking in GPG support instead. To use it, simply make sure that 'GPGOEInit' is running before starting OE – you should see a second system tray icon if it is.

BELOW: Signing outgoing mail in Outlook Express.



To send a signed or encrypted mail, create a new message as usual and click on the Sign or Encrypt buttons. If they don't appear, right click on the toolbar, hit Customize, and make sure they're enabled. When you hit the Send button, you'll be prompted for the keys to use for signing and/or encrypting, and for your passphrase if it's required.

Incoming signed and/or encrypted messages will be displayed in their raw form in the preview pane. To read an encrypted message, double click on it to open it in a new window.

Outlook Express will then prompt you for your passphrase, and the decrypted message will be displayed in another window. You can also double click on signed messages to verify them – OE will check the signature and tell you which key signed the message, and whether that key is valid or not.

If you're one of the cutting edge elite and you've made the switch to Mozilla Thunderbird for your mail, you're in for a treat, since the Enigmail extension (enigmail.mozdev.org) provides transparent GPG support.

Follow these steps to get started:

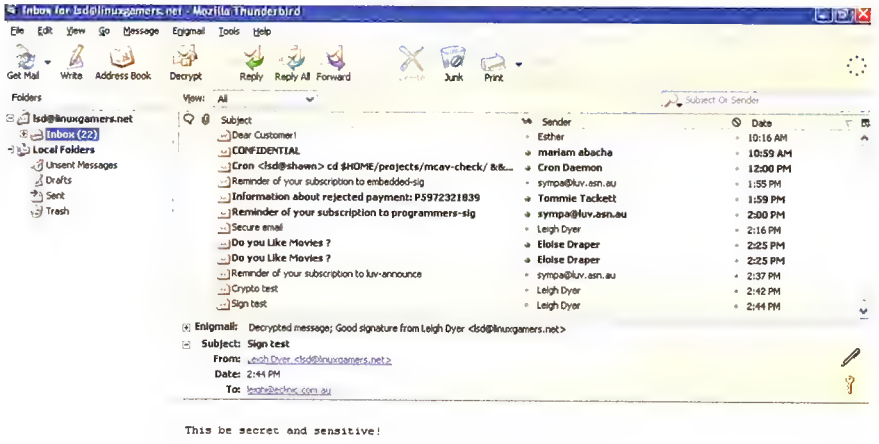
1. Download the Enigmail and Enigmime XPI packages for your version of Thunderbird from the Enigmail website.

2. Open up Thunderbird, and then open the Extensions manager (under the Tools menu). Click Install and install both packages, and then restart Thunderbird.

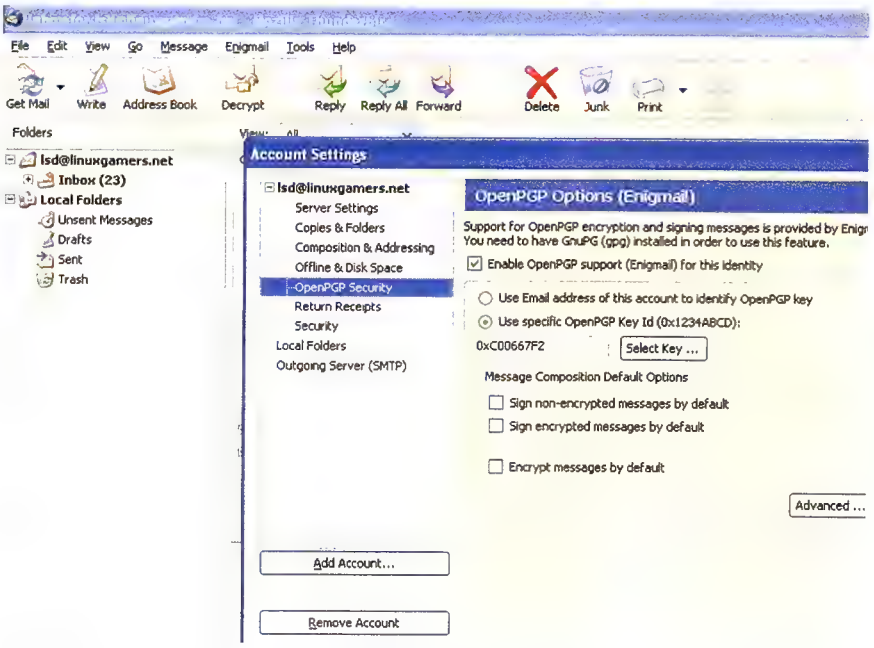
3. Select Preferences from the Enigmail menu. Under GnuPG executable path, hit Browse and select the 'gpg.exe' file that WinPT installed (usually under C:\Program Files\Windows Privacy Tools\GnuPG), and then hit OK.

4. Select Account Settings from the Tools menu. Under your email account, select OpenPGP Security, and then click to Enable OpenPGP support. Thunderbird should find your key automatically from your email address, but if not, you can also select a specific key here.

5. HTML formatting can interfere with encryption and signing, so disable the 'Compose messages in HTML format' option under Composition & Addressing. Sending signed or encrypted messages is much like in OE - write your message as usual, click on the OpenPGP button, and enable signing and/or encryption. Thunderbird will prompt you for keys and your passphrase as necessary when you click the Send button.



ABOVE: Thunderbird validates and decrypts mail transparently.



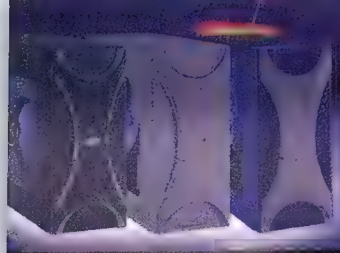
ABOVE: The Enigmail extension adds full GPG support to Thunderbird.

Thunderbird handles incoming signed and encrypted messages seamlessly. Encrypted messages are automatically decrypted after entering your passphrase, with the decrypted text displayed in the preview pane. For signed messages, Thunderbird automatically checks the signature, and displays the results above the message in the preview pane.

GPG and Linux

We haven't touched on it here, but being open source GPG naturally also has great support for Linux systems – you can use the GPG command-line app directly, or use a front end like KGPG. Most popular mail apps, including Evolution, KMail, and Mutt have built-in GPG support.

Regardless of what OS or interface you use, GPG is an easy to use, free, and effective means of keeping your data yours. LD



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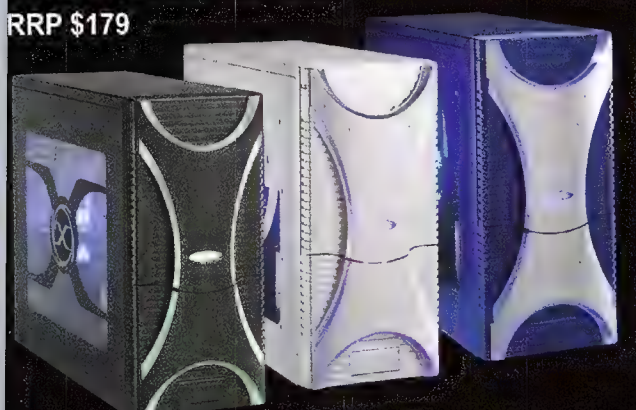

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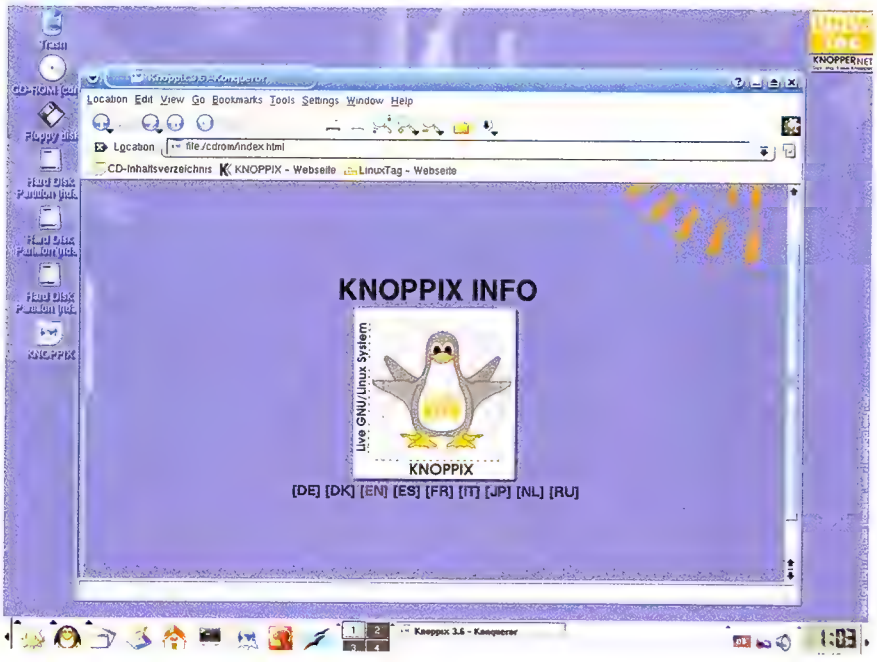
Penguin power

Knoppix is more than just a bootable Linux OS to explore, it's also a handy tool for system recovery as Leigh Dyer reveals.

This month's cover CD features the latest version of the Knoppix distribution – an all-in-one bootable OS with almost 2GB of content on a single CD, thanks to nifty compression techniques. The CD contents page (*page 9*) covers how to get started with Knoppix, but what then? By it's very nature Knoppix is both an excellent introduction to Linux as well as a powerful rescue and utility system for both Windows and Linux users. So if you so far haven't explored Knoppix, get comfy in your Lair Chair, grab a cola and a packet of bickies, and settle in for some penguin powered fun.

Bootable Tux



ABOVE: Knoppix uses the popular and intuitive KDE desktop.

ABOVE: Knoppix lets you test-drive Linux just by booting from a CD.

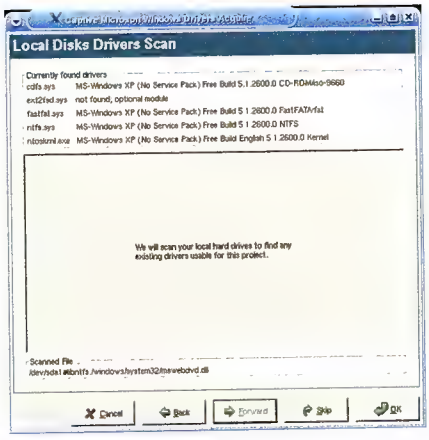
Firing up Knoppix really is as easy as booting from the CD. Hit enter at the boot prompt (or wait a few seconds) and Linux will start to boot up, automatically configuring your video, sound and networking hardware. Remember to pass boot options to better tailor Knoppix to your system, for example:

```
knoppix26 screen=1024x768 vsync=85
```

Once loaded you'll notice uses the KDE desktop, one of the most popular and full-featured desktops. If you're familiar with Windows you shouldn't be too lost, since KDE shares a number of its features. You'll find a taskbar (usually called a 'panel' on Linux desktops) at the bottom of the screen with clock, system tray, application launchers and the all-important 'K' menu.

Because the whole thing runs entirely from the CD, you can't really mess up anything permanently, so feel free to look through the menus and play with the masses of software that Knoppix ships with. Some interesting applications to look at include:

Konqueror – the KDE file manager, which doubles as a web browser Explorer-style. Click on the 'home' icon on the panel to access your home directory, where you can store your personal files – this can optionally be moved to your hard drive.
OpenOffice.org – the ultimate free office suite, containing a word processor, spreadsheet, and more. We featured Open Office for Windows on last month's CD, now here's the Linux version.
The GIMP – a powerful image editor, similar in many ways to Photoshop, which you will find in the Graphics section of the K menu.
Xine – a media player which'll handle about any file you throw at it. It's under the Multimedia section of the K menu.



ABOVE: Get full access to NTFS using Windows NTFS drivers and Captive.

It'd be impossible to list every cool app that Knoppix has to offer in these pages since there's just so many – so spend a while exporing all the menus to see what you can find.

The only thing you can't do easily when running a CD-based system is save files permanently. You can save files into your Knoppix home directory easily enough, but the home directory itself is stored in memory, so anything you put there will disappear after a reboot. Thankfully, it's not too hard to set up some more permanent storage on your hard drive.

Accessing local drives

Knoppix automatically detects any hard drives in your system and creates icons for any partitions it finds on the desktop – both Windows (NTFS, FAT) and Linux (take your pick of filesystems).

By default, drives are set up for read-only access, which does make it virtually impossible to accidentally mess up your system, but it also stops you saving anything to your hard drive.

For Linux partitions and FAT32 Windows partitions, you can enable write access easily enough – make sure you don't have the drive (or any files on it) open, then right-click on the drive icon and select Properties.

Open the Device tab in the Properties window, and disable the Read Only option. You may need to unmount and remount the drive for the change to take effect, simply right-click on the drive icon and select 'Unmount' then double click on it again to mount and open it as before.

NTFS Windows drives are a bit more tricky since the standard Linux NTFS kernel driver only supports reading, however Knoppix can make use of a rather nifty package called *Captive* – this swank software will first search your Windows drives for the native Windows NTFS driver (ntfs.sys) using Linux's normal NTFS support, then load the Windows driver into the kernel through some emulation trickery in order to mount your NTFS partition with read and write support. How cool is that?

However, under Knoppix 3.6 at least, there's a little bug with Captive and a work around is required. Here's a quick guide to getting it working:

1. Open a terminal window (there's a launcher on the panel) and type the following commands:

```
sudo sh
  useradd -u 108 -g nogroup -d
  /var/lib/captive -s /bin/false
  captive
echo 'captive:x:116' >/etc/group
exit
```

2. Open the K menu, and select KNOPPIX --> Utilities --> Captive NTFS. This wizard will search your system for NTFS drivers – the drivers from standard Windows XP or XP SP1 will do. If you're running a different version of Windows (like 2000, or XP SP2), the wizard can download a copy of XP SP1 and extract them. Once you have found or downloaded the proper drivers, simply hit OK.

3. From a terminal window, you can now mount your drive with a command like the one below:

```
sudo mount -t captive-ntfs -o
  uid=knoppix /dev/hda1
  /mnt/hda1
```

Again, you only need Captive if you want to write to your NTFS drives from Knoppix. Read support is fully supported by the kernel by default.

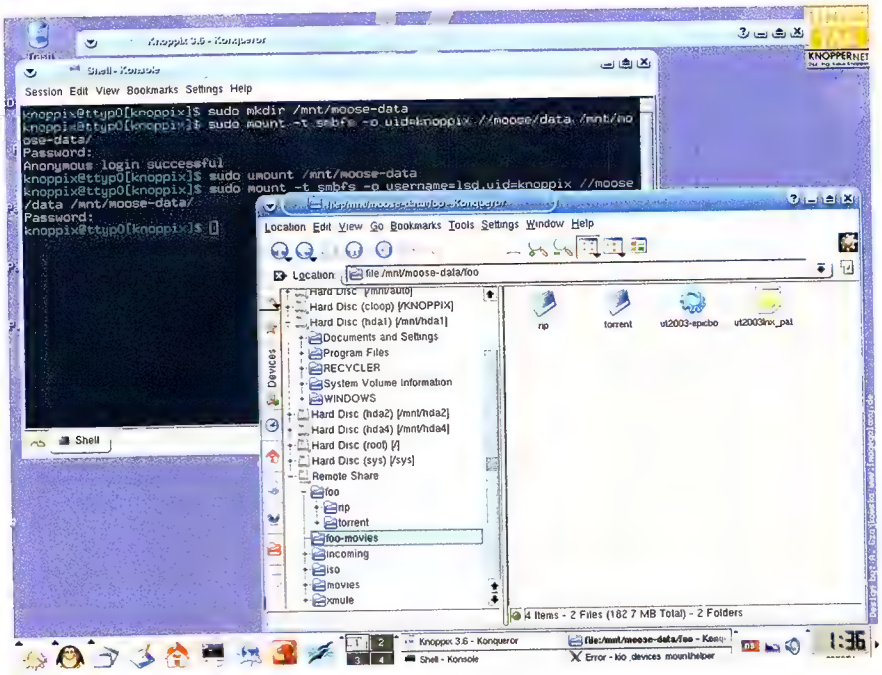
A home of my own

Storing files straight on your existing partitions is good, but a better option in the long term is to create a permanent home directory for yourself. This can either be a dedicated partition, or an image file on an existing Linux or FAT32 Windows partition:

1. If you want a dedicated partition for your home directory, fire up 'QTParted' from the K menu and create and format your partition – check my QTParted guide for more information on doing this.

2. Open the K menu, and select KNOPPIX --> Configure --> Create a persistent KNOPPIX home directory.

3. Select your new or existing partition from the list.



ABOVE: Accessing network shares is simple and easy to set up.

4. A dialog box will appear asking if you want to use the full partition or just an image on an existing partition. Select the proper option you require (Yes to use the whole partition, No to create an image).

5. If you're creating an image on an existing partition, you need to specify the image size.

After creating your home partition, tell Knoppix where to find it on boot. At the boot prompt, instead of hitting enter, use a boot line like this, specifying the partition you selected earlier:

```
knoppix26 home=/dev/hda2
```

Networking

If you've got a typical LAN setup with a router running DHCP, then you should be set – Knoppix should have detected your network card and configured your connection automatically. For non-DHCP LAN setups, you can configure your network card manually.

Open the K menu, select KNOPPIX --> Network --> Internet --> Network card configuration, and follow the prompts.

You can also use dialup and ADSL connections with Knoppix – there are various wizards available under KNOPPIX --> Network --> Internet in the K menu. For dialup connections, use the /dev/modem wizard to select your modem, and then the Modem Dialer to connect to your ISP.

Knoppix can also connect to Windows Networking shares. The simplest way to do this is from a terminal window, using commands like these, replacing the details with your real computer and share names and user account details:

```
sudo mkdir /mnt/server-share
sudo mount -t smbfs -o
  username=foo,password=bar,
  uid=knoppix //server/share
  /mnt/share
```

If you don't have access restrictions on your shares, just use '-o guest,uid=knoppix' instead.

To browse through mounted shares, open Konqueror by clicking on a drive (or the Home icon on the panel), and open the Devices section (marked by an icon with three coloured cubes) on the left. The Devices section lists all available drives, including mounted shares.

Knoppix to the rescue

Being a complete Linux system, Knoppix has some handy tools for disaster recovery, for both Linux and Windows systems. If for example your Windows boot has died, but you need to recover some files from your drive before reformatting or rebuilding, you can use Knoppix to gain access to your drives and easily share their contents over a network or copy them to another disk for backup. To setup network sharing you will need to do the following:

1. Open the K menu and select KNOPPIX --> Services --> Start Samba Server.

2. When prompted, enter a password to use for the knoppix user.

3. Knoppix will ask if you wish to export your hard drives as shares. Click Yes.

4. Go to a nearby Windows box and search for computers on the network – you should find a machine called 'knoppix' Connect to it using the username 'knoppix' along with the password you entered earlier, and you should see a share for each drive on the Knoppix system.

Another common use for Knoppix is as an aid for rebuilding or restructuring systems – you can delete, create, resize, and even copy all manner of partitions, even those containing NTFS filesystems.

To do this Knoppix comes with a handy tool called QTParted, which is essentially the Linux answer for Partition Magic. It's based on a command-line tool called `parted`, and uses various filesystem-specific tools to do its bidding. You'll find it under the System section of the K menu. Using QTParted is simple:

1. In the QTParted window, select a drive on the left and the partition table will appear as both a list and a graph on the right.

2. Right-click on a partition to resize, move or format it, or right-click on some free space to create a new partition there. The changes you make aren't executed straight away – they're queued up, so you can make lots of changes without having to wait for operations to complete in-between.

3. To commit your changes to disk, select Commit from the Device menu.

QTParted can resize and format partitions in various formats, including ext2/3, XFS, FAT32, and NTFS.

That covers creating, deleting, and resizing Windows and Linux partitions, but didn't we also say 'copy' as well? You can use the 'disk duplicate' command in Linux to duplicate partitions like so:

1. First of all, make sure you have a partition the *exact* same size as the one you want to copy, either on the same drive or a separate drive. Use QTParted to resize and create partitions if you need to.

2. Make a note of the '/dev/hda?' entries in QTParted that represent the partitions on your system. Write down those that correspond to the source and target the particular partitions you want to duplicate.

3. Open up a terminal and use the `dd` command like so:

```
dd if=/dev/hda1 of=/dev/hdb1
```

Where 'hda1' and 'hdb1' correspond to your source and target partitions. A brief note on Linux partition naming: 'hd' is IDE hard drive, 'sd' SCSI hard drive; 'a' is first drive, 'b' is second drive; '1' is first partition, '2' second and so on. Thus, '/dev/hdb3' would be the 3rd partition on the second IDE drive.

The program `dd` performs a byte for byte copy, 'if' stands for 'in file' while 'of' is, of course, out file. Who says Linux is hard? Because `dd` performs byte for byte copies, you can just as easily mirror an entire drive with the same command by simply not specifying partitions, like so:

```
dd if=/dev/hda of=/dev/hdb
```

Memory testing

Lastly Knoppix also includes memtest86, a hardcore memory testing and diaganosis tool. If you suspect memory problems, such as dying modules, or merely want to see if your memory is operating stable at overclocked frequencies, memtest86 is the most thorough tool available. Proper testing can take hours, and ideally needs to be done on a completely clean system before any OS is loaded so all memory areas can be tested. For this reason memtest86 comes as a bootable option on the Knoppix disk, simply type 'memtest' at the Knoppix boot prompt to launch it.

Knoppix is not only an excellent introduction to the power of Linux, it's also a superb system recovery tool, regardless of what OS you use. LD

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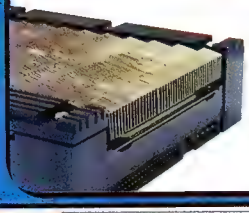

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CI/ANOV04

DON'T CUT IT! PHOTOCOPY IT!

Current subscribers prize

Pitch a tent and play Xbox! If you couldn't before, you can now, if you win one of the lovely Xbox tents we're giving away as this month's current subscriber prize. Enjoy the moonlight (or sunshine) while you plug away at Halo or one of those other quality Xbox titles. We'll let you figure out how exactly you'll power it all, and what happens if a swarm of angry badgers descends on your gaming getaway!

To win, just do nothing, provided that you're a current subscriber. Otherwise, subscribe this month, have a chance to win this issue's subscriber prize and then each and every month be in the running to grab an awesome gift!
For doing nothing! We thought we should repeat that. Thanks to Xbox for supplying these sturdy rain-deflectors!

Why subscribe?

☑ Cheap Atomic! Preserve your pennies for other mondo-cool gear.

☑ Door-delivered Atomic techy goodness! Never leave the house again.

☑ Get *Atomic*! It is, by far, the best tangible entity in existence.

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W Richards, Gordon NSW.
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Terms and conditions: 1. Information on how to enter and receive the promoted prize form part of these Conditions of Entry. 2. Entry is open to all residents of Australia and New Zealand who subscribe/renew with this offer between 20.10.04 to 17.11.04. To have a valid entry in current subscribers competition you must have a current paid subscription on the 17.11.04. 3.The draw will be held at the offices of AJB at 5pm on the 17.11.04. Winners will be notified by mail and published in Atomic 48. 4.The prizes are not transferable or exchangeable and cannot be taken as cash. The judge's decision is final and no correspondence will be entered into. 5. The Promoter reserves the right to verify the validity of each entry. 6. Please allow up to 30 days for delivery of all advertised prizes after the end of the

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SUBSPACE

Win the complete series of Star Trek: The Next Generation ➤ $1540 worth of DVD trekking!

It's *Star Trek* madness this month as far as content and prizes go. Maybe it's brain slugs from Optimus V, or dimensional warp worms from the twelfth plane of Guntarg. Whatever may be influencing us in magically delightful ways, we've giving you the chance to win an extraordinary large set of *Star Trek: The Next Generation* DVD boxsets courtesy of Paramount Home Entertainment. Why large? Because baby, it's the *ENTIRE* series of ST:TNG!

That's more Star Trek goodness than you can poke a phaser at or, better yet, a communicator (see *page 38*)! If you think you can find a better reason to stay at home and watch DVDs, we'll jump into a Galaxy Class starship and save a race of pygmy aliens! Just for you!

Star Trek: The Next Generation

- 48 DVDs, spanning the entire ST: TNG series
- $1540 worth of trekkie goodness
- Relive the magical time when Picard was Captain and Riker wasn't directing terrible movies!
- See Data before he exploded!

Star Trek: Generations Special Edition

instore November 11

Star Trek: The Original Series

Season 2 instore November 11, Season 3 instore December 9.

Star Trek: Voyager

collect all 7 seasons! Seasons 1-3 instore now.

PREV

NEXT

OTHER FUN STAR TREK FACTS

- Kirk was a sissy!
- Phasers are made in a Black & Decker appliance factory! No really!
- According to spatial astrophysics, subspace is impossible. But only if you don't have a warp drive.
- The actor who played Wesley Crusher, Wil Wheaton, has his own website – www.wilwheaton.net. He's such a geek, he even uses Linux.
- Captain Kirk's famous 'Corbomite Maneuver' is just a fancy-pants way of saying 'I bluffed your arse, punk!' in the 23rd century.
- The first Star Trek original series episode 'When no man has gone before' aired on TV in 1966!

promotion. 7. The Promoter accepts no responsibility for any variation in any prize value. 8. No responsibility is accepted for late, lost or misdirected entries. 9. The Promoter is not responsible for any incorrect or inaccurate information, either caused by website users or by any of the equipment or programming associated with or made use of in this offer, or by any technical error that may occur in the course of the administration of this promotion. The Promoter assumes no responsibility for any error, omission, interruption, deletion, defect, delay in operation or transmission, communications line failure, theft or destruction or unauthorised access to or alteration of entries. 10. Any costs associated with accessing www.atomicmpc.com website is the entrant's responsibility and is dependent on the internet service provider used. 11. The Promoter is not responsible for any contact details entered incorrectly on www.atomicmpc.com website. 12. The Promoter collects entrants' personal information in order to conduct the promotion. If the information requested is not provided, the entrant may be considered ineligible for the prize. 13. By entering the promotion, unless otherwise advised, each entrant also agrees that the Promoter may use this information, or disclose it to other organisations that may use it, in any media for future promotional, marketing and publicity purposes without any further reference, payment or other compensation to the entrant. A request to access, update or correct any information should be directed to the Promoter at their address set out below. 14. The Promoter is AJB Publishing of Suite 3, 44-70 Rosehill Street, Redfern, NSW 2016. A.B.N. 76 951 889 503.

Lost in Translation

Welcome to Lost In Translation, the section dedicated to the wierd and wonderful world of language mangling and the linguistic oddities we come across every day. All of these are genuine, and are presented in the spirit of friendly amusement. If you find something whacky and wonderful in your travels, in a manual, or on a box send it through to wtf@atomicmpc.com.au

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Google is a bad place

Logan Booker protects innocent eyes against internet nasties.

The internet has never been a safe place for the humble human sensory organs known as 'the eyes'. In fact, if Virt Cerf, co-developer of the beloved TCP/IP protocol, had known what twisted content it would birth, he'd have demanded each and every modem sold be bundled with an ice-cream scoop to facilitate their quick removal.

Google's Image Search is perhaps the most famous harbour of the internet's more disturbing content and sifting through its massive cache of pictures is not so much a search for an image as it is a journey of self-discovery. Far be it from us to tell you what you should enter into its innocent-looking keyword text box, but we have taken the liberty of compiling the following list of words you *shouldn't* enter. Ever.

Note: If, for some bizarre reason, you feel the need to enter any of these into Google's Image Search, you'll need to turn off the engine's 'SafeSearch' feature to fully appreciate the bounds of human creativity.

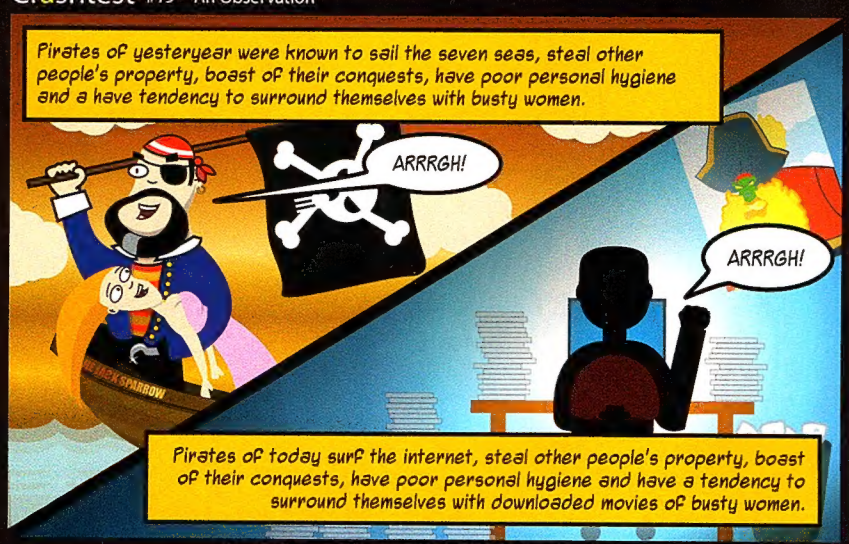
Teabag – It's a shame that people are intent on calling disturbing sexual practises after mundane objects – in this case, the teabag. We can be reasonably confident that when Chinese Emperor Shen-Nung took that first ever recorded sip of tea back in 2737BC, the thought of dunking his nether-regions into the awaiting mouth of his oblivious, sleeping partner were far from his mind. It's equally unlikely that Thomas Lipton patented the four-sided teabag in 1915 with the dream that almost a century later, someone would use the name of his product to describe a bizarre and totally unique way of assailing someone's oral faculties.

Furry – 'Furry' takes yet another facet of humanity gone bad and displays it for the world to see, complete with high resolution images that will forever destroy your childhood memories of Sonic and Tales, and links to fan fiction so brutally descriptive it will make your brain ache.

Tentacle – The word 'tentacle' is a dangerous collection of letters to enter by themselves into Google's Image Search. 'Tentacle' should always followed by another word, such as 'octopus' or 'fishing', for the images 'tentacle' will procure unescorted are not the sort one wants to be caught with in their browser cache, or worse, on their screen. This one segment of hentai anime generates more profit than all other anime markets combined – including Pokemon.

Goatse – It's everywhere now – rubix cubes, mountain ranges... even the flashlight in Doom 3. Google makes it possible to relive that joyous time when the Goatse webpage was freely accessible. Rest assured that, thanks to the world's population of 12-year olds, Goatse will continue to destroy the sensitivities of unsuspecting web surfers the world over.

Crashtest #19 - "An Observation"



Written & Illustrated by Craig Simms.

atomican

When Atomicans party, it always goes off with a bang. So it's unsurprising that, when two popular Atomicans tied the knot last month, it was a *shotgun* wedding.

Featuring more matrimonial firepower than Quentin Tarantino's *Kill Bill*, the nuptials of Lord Dread and Fatal-Error were held at Action Paintball in Sydney.

Chaos Lady served as maid of honour, contributing a tastefully camouflaged wedding cake complete with marzipan paintballs. Forum SuperHero Phr33x served as best man, and dozens of other Atomicans filled out the ranks.

But when the marriage celebrant finally declared 'you may now shoot the bride', there was no time for a 21-gun salute. It was straight to the trenches for a day of bruising battle.

As each paintball thudded home, participants quickly learnt the difference between CounterStrike mouse clicks and projectile physics...

Hit of the day was taken by Snakeoil, direct to the head, as he 'took cover' behind Demented Freak. Felipe's flash-bang grenades, dispensed by an apparently overclocked digital camera, were declared illegal Weapons of Mass Distraction.

By sunset, an armistice had been declared. The wedding party, resembling a Jackson Pollock painting, downed weapons and trooped off to the reception venue.

As they partied into the night, not even Nazi bouncers on a casual footwear raid were able to contain the victory celebrations. Though Cheeky Chops, whose bright pink uggboots were taken into custody, was heard later on to lament no longer having a rifle handy.

POTM 46

This month we are drawn in by a killer post about Half Life 2.

Marketing Freeman

www.atomicmpc.com.au/forums.asp?s=3&c=12&t=5817

By Saponification

POTM 46, and we bloody loved it. Top writing, great angle and I think a lot of us are just a bit more enlightened as a result.

Good one. MX510 for you Saponification!

Bet you still ain't playing your favorite PC game the way it was meant to be played!

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